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THE

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ARRANGED IN CONFORMITY WITH ITS ORGANIZATION,

BY THE BARON CUVIER,

PERPETUAL SECRETARY TO THE ROYAL ACADEMY OF SCIENCES, ETC. ETC. ETC.

THE CRUSTACEA, ARACHNIDES AND INSECTA,

BY P. A. LATREILLE,

MEMBER OF THE ROYAL ACADEMY OF SCIENCES, ETC. ETC. ETC.

TRANSLATED FROM THE FRENCH,

WITH NOTES AND ADDITIONS,

BY H. M'MURTRIE, M.D. &c. &c.

IN FOUR VOLUMES, WITH PLATES.

VOLUME II.

NEW YORK:

G. & C. & H. CARVILL.

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FIRST GREAT DIVISION OF THE ANIMAL KINGDOM.

CLASS III.

REPTILIA.

The disposition of the heart in Reptiles is such, that at each contraction, a portion only of the blood it has received from the different parts of the body is transmitted to the lungs, the remainder returning to those parts without having passed through the pulmonary organs, and without having respired.

The result of this is, that the action of oxygen upon the blood is less than in the Mammalia, and that if the quantity of respiration in the latter, in which all the blood is compelled to pass through the lungs before it returns to the rest of the body, be expressed by a unit, that of Reptiles will be expressed by a fraction of a unit, so much the smaller, as the quantity of blood transmitted to the heart at each contraction is less.

As it is from respiration that the blood derives its heat, and the fibre its susceptibility of nervous irritation, the blood of reptiles is cold, and the muscular energy less than that of Quadrupeds, and much less than that of Birds; thus we find their movements usually confined to crawling and swimming; for, though at certain times several of them jump and run with considerable activity, their habits are generally lazy, their digestion excessively slow, and their sensations obtuse.

In cold or temperate climates almost all of them pass the winter in a state of torpor. Their brain, which is proportionally very small, is not so essentially requisite to the exercise of their animal and vital faculties, as to the members of the two first classes; their sensations seem to be less referred to a common centre, for they continue to live and to exhibit voluntary motions, long after losing their brain, and even after the loss of their head. A communication with the nervous system is also much less necessary to the contraction of their fibres, and their muscles preserve their irritability after being severed from the body much longer than those of the preceding classes; their heart continues to pulsate for hours after it has been torn away, nor does its loss prevent the body from moving for a long time. The cerebellum of several has been observed to be extremely small, a fact which tallies with their slight propensity to motion.

The smallness of the pulmonary vessels permits reptiles to suspend the process of respiration without arresting the course of the blood; thus they dive with more facility, and remain longer under water than either the Mammalia or Birds. The cells of their lungs, being less numerous, because they have fewer vessels to lodge on their parietes, are much wider, and the organs themselves sometimes resemble simple sacs with scarcely any appearance of cells.

Although some of them are incapable of producing audible sounds, they are all provided with a trachea and larynx.

Their blood not being warm, there was no necessity for teguments capable of retaining heat, so that they are covered with scales or simply with a naked skin.

The females have a double ovary and two oviducts; the males of several genera have a forked or double penis, those of the last order, the Batrachians, have none.

No reptile hatches its eggs, and in several genera of the Batrachiæ, they are fecundated after their exclusion from the female, in which case the egg is enveloped by a membrane only. The young of this latter order, on quitting the egg, have the form and branchiæ of Fishes, and some of its genera

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The quantity of respiration in Reptiles is not fixed like that of the Mammalia and Birds, but varies with the proportion of the diameter of the pulmonary artery compared to that of the aorta. Thus Tortoises and Lizards respire more than Frogs, &c.; and hence a much greater difference of sensibility and energy than can exist between one of the Mammalia and another, or between Birds.

Reptiles accordingly present an infinitely greater variety of forms, motions, and properties than are to be found in the two preceding classes, and it is in their production that Nature seems to have amused herself by imagining the most fantastic shapes, and by modifying in every possible way the general plan she has followed in the construction of the Vertebrated animals, and in the Oviparous classes especially.

The comparison, however, of their quantity of respiration and of their organs of motion, has enabled M. Brogniart to divide them into four orders,(2) viz.

The Chelonia, or Tortoises, whose heart has two auricles, and whose body, supported by four feet, is enveloped by two plates or bucklers formed by the ribs and sternum.

The Sauria, or Lizards, whose heart has two auricles, and whose body, supported by four or two feet, is covered with scales.

The Ophidia, or Serpents, whose heart has two auricles, and whose body always remains deprived of feet.

The Batrachia, whose heart has but one auricle, and whose body is naked, most of which pass, with age, from the form of a Fish respiring by branchiæ, to that of a Quadruped breathing by lungs. Some of them, however, always retain their branchiæ, and a few have never more than two feet.(1)

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(1) The Colubers, for instance, when deprived of water, as proved by the experiments of M. Geoffroy.

(2) Al. Brogniart, *Essai d'une Classification Naturelle des Reptiles*, Paris, 1805, and in the *Mém. des Savants Etrang.*, tom. 1, p. 587.

ORDER I.

CHELONIA.

The Chelonia, better known by the name of Tortoises, have a heart composed of two auricles, and of a ventricle divided in two unequal cavities, which communicate with each other. The blood from the body is poured into the right auricle, that from the lungs into the left, but the two streams become more or less mingled in passing through the ventricle.

These animals are distinguished at the first glance by the double shield in which the body is enveloped, and which allows no part to project except their head, neck, tail, and four feet. The shell (or upper shield) is formed by the ribs, of which there are eight pair, widened and reunited by denticulated sutures, and with plates adhering to the annular portion of the dorsal vertebra, so that all these parts are rendered fixed and immovable. The inferior shell is formed of pieces, usually nine in number, analogous to a sternum.(2) A frame composed of bony pieces, which have been considered as possessing some analogy with the sternal or cartilaginous portion of the ribs, and which in one subgenus always remains in a cartilaginous state, surrounds the shell, uniting and binding together all the ribs which compose it. The vertebræ of the neck and tail are consequently the only ones which are movable.

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(1) The Sauria and Ophidia are differently arranged by some others, Merrem, for instance. They detach the Crocodiles, to form a separate order, and unite the first family of the Ophidia or Anguis to the remainder of the Sauria, a distribution which is founded on some peculiarities in the organization of Crocodiles, and on a certain resemblance of Anguis to the Lizards. We merely indicate these affinities, which are almost wholly internal, preferring a division more easily applied.

(2) See Geoff. An. du Mus. t. XIV, p. 5; and on the entire osteology of the Tortoises, my Rech. sur les oss. foss. tom. V, 2e partie. [N.B. It is well to remark, that I shall hereafter designate the upper shell by the single word *shell* (*testa*) and the inferior by *sternum*. *Am. Ed.*]

These two bony envelopes being immediately covered by the skin or by plates, the scapulæ and all the muscles of the arm and neck, instead of being connected with the ribs and spine, as in other animals, are attached beneath: the same arrangement is found in the bones of the pelvis and all the muscles of the thigh, so that in this respect the Tortoise may be said to be an *inverted* animal.

The vertebral extremity of the scapula is articulated with the shell; and the opposite limit, which may be considered analogous to a clavicle, is joined to the sternum. So that the two shoulders form a ring through which pass the œsophagus and trachea.

A third bony branch, larger than either of the others, and directed downwards and backwards, represents, as in Birds, the coracoid apophysis, but its posterior extremity is free.

The lungs have considerable extent, and are situated in the same cavity with the other viscera.(1) The thorax, in most of them, being immovable, it is by the play of its mouth that the Tortoise respires, which it effects by keeping the jaws closed, and alternately raising and depressing the os hyoides. The former of these motions permits air to enter through the nostrils, the tongue then closes the internal orifice of those apertures, when the latter forces the air into the lungs.(2)

Tortoises have no teeth; their jaws are invested with horn like those of Birds; the Chelydes excepted, where they are covered with skin only. Their tympanum and palatine arches are fixed to the cranium and are immovable; their tongue is short and bristled with fleshy filaments; their stomach simple and strong; their intestines of a moderate length and destitute of a cæcum. Their bladder is very large.

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(1) Observe that in all those reptiles in which the lung penetrates into the abdomen (and the Crocodile is the only one in which it does not) it is enveloped like the intestines by a fold of the peritoneum, which separates it from the abdominal cavity.

(2) With respect to this mechanism, which is common to Tortoises and to the Batrachians, see the Mem. of Robert Townson, Lond. 1779.

The penis of the male is simple and large, and the eggs laid by the female are invested with a hard shell. The former is frequently known by its exterior from the concavity of its sternum.

They possess great tenacity of life,—and instances are on record in which they have been seen to move for several weeks after losing their head. They require but little nourishment, and can pass whole months and even years without eating.

The Chelonia were all united by Linnæus in the genus

TESTUDO, Lin.

They have since been divided into five subgenera, chiefly from the forms and teguments of their shell, and of their feet.

TESTUDO, Brog.(1)

The land Tortoises have the shell arched and supported by a solid, bony frame, most of its lateral edges being soldered to the sternum; the legs, as if truncated, with very short toes, which are closely joined as far as the nails, all susceptible of being withdrawn between the bucklers; there are five nails to the fore-feet, the hind ones have four, all stout and conical. Several species live on vegetable food.

> *T. græca*, L.; Schæpf. pl. viii, ix, is the species most common in Europe; it is found in Greece, Italy, Sardinia, and apparently all round the Mediterranean. It is distinguished by its wide and equally arched shell; by its raised scales or plates, which are granulate in the centre, striated on the edges, and marbled with large yellow and black spots; and by its posterior edge in the middle, of which there is a prominence slightly bent over the tail. It rarely attains the length of a foot, lives on leaves, fruit, insects, and worms, excavates a hole in which it passes the winter, and breeds in the spring, laying four or five eggs similar to those of a Pigeon.

Among the species foreign to Europe there are several from the

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(1) Merrem has changed this name into CHERSINE.

East Indies, of an enormous size, and three feet, and upwards, in length. One of them in particular has been called the

Test. indica, Vosm.; Schœpf. Tort. pl. xxii. (The India Tortoise.) Its shell is compressed in front, and its anterior edge is turned up above the head. Its colour is a deep brown.

Some of them are remarkable for the beautiful distribution of their colours; such are,

T. geometrica, L.; Lacep. I, ix; Schœpf. x. (The Geometrica.) A small Tortoise, each plate of whose shell is regularly ornamented with yellow lines, radiating from a disk of the same colour.

T. radiata, Shaw, Gen. Zool. III, pl. ii; and Daud. II, xxvi. (The Couï.) A New Holland species, ornamented with nearly as much regularity as the Geometrica, but which attains a much larger size.(1)

In some species, the Pyxis, Bell., the anterior part of the sternum is movable like that of the Box-Tortoises; others again, the Kinixys, Id., can move the posterior portion.(2)

Emys, Brongn.(3)

The fresh-water Tortoises have no other constant characters by which they can be distinguished from the preceding ones, than the greater separation of the toes, which are terminated by longer nails, and the intervals occupied by membranes; even in this respect there are shades of difference. They likewise have five nails before and four behind. The form of their feet renders their habits more aquatic. Most of them feed on insects, small fishes, &c. Their envelope is generally more flattened than that of the land Tortoises.

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(1) Add: *T. stellata*, Schœpf. XXV;—*T. angulata*, Schweig;—*T. areolata*, Sch., XXIII;—*T. marginata*, Sch. XII, 1, 2;—*T. denticulata*, Sch., XXVIII, 1;—*T. cafra*, Schweig;—*T. signata*, Schw.;—*T. carbonaria*, Spix, XVI;—*T. Hercules*, Id. XIV; —*T. cagado*, Id. XVII;—*T. tabulata*, Sch., XIII;—*T. sculpta*, Spix, XV;—*T. nigra*, Quoy and Gaym. Voy. de Freycin. Zool. XXXVII;—*T. depressa*, Cuv.;—*T. biguttata*, Id.;—*T. carolina*, Le Conte, &c.*

(2) See the paper of M. Bell., in the Lin. Trans. Vol. XV, part 2, p. 392; in two of these *Kinixys* which we have seen living, the edges of the joint in the shield were worn away, or as if carious, and to such a degree as to induce a suspicion that there was something morbid in this conformation.

(3) From ἐμυς, Tortoise.

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* This is a mistake of our author; it is the *T. carolina*, Gmel., the *T. polyphemus* of others. *Am. Ed.*

Test. europæa, Schn.; *T. orbicularis*, L.; Schœpf. pl. I(1) (The Fresh-water Tortoise of Europe), is the most universally diffused species; it is found in all the south and east of Europe as far as and in Prussia. Its shell is oval, but slightly convex, tolerably smooth, blackish, and every where dotted with yellowish points arranged in radii. It attains the length of ten inches; its flesh is used as food, and it is reared for that purpose with bread, young vegetables, &c. Marsigli says, its eggs are a year in being hatched.

Test. picta; Schœpf. pl. iv (The Painted Tortoise), is one of the most beautiful species; it is smooth and brown, each plate being surrounded with a yellow band, which is very broad on the anterior edge. It is found in North America along the shores of brooks, on rocks or trunks of trees, whence it plunges into the water on the first alarm.(2)

Among the fresh-water Tortoises we should remark

The Box-Tortoises,(3)

The sternum of which is divided by a movable articulation into two lids, which, when the head and limbs are withdrawn, completely encase the animal in its shell.

In some the anterior lid only is movable.(4)

In others both are equally so.(5)

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(1) It is the same as the *verte et jaune*, Lacep. pl. vi, and his *ronde*, pl. v, see the Monog. of this species by M. Bojanus, Vilna, 1819, fol.

(2) Add *Em. lutaria*, Lacep., IV;—*Em. Adansonii*, Schweig;—*Em. senegalensis*, Dumer.;—*Em. subrufa*, Lacep., XIII;—*Em. contracta*, Schweig;—*Em. punctata*, Schœpf. V;—*Em. reticulata*, Daud.;—*Em. rubriventris*, Le Conte;—*Em. serrata*, Daud. II, xxi;—*Em. concinna*, Le Conte, or *geometrica*, Lesueur;—*Em. geographica*, Lesueur;—*Em. scripta*, Schœpf., III, 4;—*Em. cinerea*, Id. II, 3;—*Em. centrata*, Daud. or *terrapen*, Schœpf., XV;—*Em. concentrica*, Le Conte;—*Em. odorata*, Id.;—*Em. fusca*, Lesueur;—*Em. leprosa*, Schw.;—*Em. nasuta*, Id.;—*Em. dorsata*, Schœpf.;—*Em. pulchella*, Schœpf., XXVI, or *insculpta*, Le Conte;—*Em. lutescens*, Schw.;—*Em. expansa*, Id.;—*Em. Macquaria*, Cuv. Em. guttata Em. picta.

M. Fitzinger separates under the name of CHELODINA, and M. Bell under that of HYDRASPIS, those species which have a more elongated neck, such as the *Em. longicollis*, Shaw, Gen. Zool. III, part. I, pl. xvi;—*Em. planiceps*, Schœpf., XXVII, or *canaliculata*, Spix, VIII;—*Em. platicephala*, Merrem;—*Em. depressa*, Spix, III, 2;—*Em. caruncu lata*, Aug. St. Hil.;—*Em. tritentaculata*, Id.

(3) This subdivision gave Merrem his genus TERRAPENE, Spix his KINOSTERNON, and Fleming his CISTUDA. The European species, and others already partake of this movability, which renders the task of limiting the genus a difficult matter.

(4) *Test. subnigra*, I, vii, 2;—*T. clausa*, Schœpf., VII.

(5) *La Tortue à boîte d'Amboine*, Daud. II, 309;—*Test. tricarinata*, Schœpf., II;—*Test. pennsylvanica*, I, d. xxiv. [To which may be added *T. odorata*, Daud. *Am. Ed.*]

There are some Fresh-water Tortoises, on the contrary, whose long tail and voluminous members cannot be completely retracted within the shell. This approximates them to the following subgenera, and particularly to the Chelydes, and renders them consequently worthy of distinction.(1) Such is,

Test. serpentina, L.; Schœpf. pl. vi. (The Snapper.) Easily recognised by its tail, which is nearly as long as its shell, and bristled with sharp and dentated crests, and by its pyramidically elevated plates. It is found in the warm parts of North America, where it destroys numbers of fishes and aquatic birds, wanders far from rivers, and sometimes weighs upwards of twenty pounds.

CHELONIA, Brongn.(2)

The envelope of the Sea Tortoises(3) is too small to receive their head, and particularly their feet, which are very long (the anterior ones most so,) and flattened into fins. The toes are all closely united in the same membrane, the two first ones of each foot being alone furnished with pointed nails, one or other of which at a certain age is usually lost. The pieces of their sternum do not form a continuous plate, but are variously notched, leaving considerable intervals which are filled with cartilage only. The ribs are narrowed and separated from each other at their external extremities; the circumference of the shell, however, is surrounded with a circle of pieces corresponding to the ribs of the sternum. The temporal fossa is covered above by an arch formed by the parietal and other bones, so that the whole head is furnished with an uninterrupted osseous helmet. The internal surface of the œsophagus is every where armed with sharp cartilaginous points which incline towards the stomach.

Test. mydas, L.;(4) *T. viridis*, Schn.; Lacep. I, 1 (The Green Tortoise), is distinguished by its greenish plates, thirteen in number, which are not arranged like tiles; those of the middle range are almost regular hexagons. It is found from six to seven feet long, and weighing from seven to eight hundred pounds. Its flesh is highly esteemed, and furnishes a wholesome and palatable supply of food to the mariner in every latitude of the torrid zone. It feeds in large troops on the sea-weed at the bottom of the ocean, and approaches the mouths of rivers to respire. The eggs it deposits in the sand to receive the vivifying influence of the sun, are excellent food; its shell is of no value.

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(1) This subdivision has furnished M. Fitzinger with his genus CHELYDRA, and M. Fleming with that of CHELONURA.

(2) *Chelonia*, from χελονη. Merrem has preferred the barbarous name of CARETTA.

(3) Commonly, but absurdly, termed *Turtle*; they might, with equal propriety, be called Doves. *Am. Ed.*

(4) This name of *Mydas* was taken by Linnæus from Niphus. Schneider considers it as a corruption of ἐμυς.

In a neighbouring species, *Chel. maculosa*, Nob., the middle plates are twice as long as they are broad, and of a fawn-colour, marked with large black spots. In a second, *Chel. lachrymata*, Nob., whose middle plates are similar to those of the maculosa, the last is so raised as to form a knob, and the fawn colour is marked with black streaks. The shell is employed in the arts.

Test. imbricata, L.; *Le Caret;* Lac. I, 11; Schœpf. XVIII, A. Smaller than the viridis, has a longer muzzle and denticulated jaws; there are thirteen fawn-coloured and brown plates which overlap each other like tiles; its flesh is disagreeable and unwholesome, but the eggs are delicious, and it furnishes the finest kind of shell employed by comb-makers, &c. It inhabits the seas of hot climates.

There are also two species which approximate to the imbricata, *Chel. virgata*, Nob.; Bruce, Abyss., pl. xlii, whose plates are less elevated, the middle ones equal, but with more acute lateral angles, and marked in radii with black specks; and *Chel. radiata*, Schœpf. xvi, B, which only differs from the preceding in the increased breadth of the last middle plate; it is perhaps a mere variety.

Test. caretta, Gm.; *La Caouane;* Schœpf. pl. xvi, is more or less brown or red, and has fifteen plates, the middle ones of which are ridged, particularly towards their extremities; the point of the upper mandible is hooked, and the anterior feet are longer and narrower than in the neighbouring species, preserving two larger nails. It is found in different seas and even in the Mediterranean; it feeds on shell-fish; the flesh is not eaten, and its shell is of little value, but it yields good lamp-oil.

Merrem has recently distinguished, by the name of Sphargis, those Cheloniæ whose shell is destitute of plates, and merely covered with a sort of leather.(1) Such is

Test. coriacea, L.; *Le Luth;* Lacep. I, iii; Schœpf. xxviii. A very large species of the Mediterranean. Its shell is oval and pointed behind, exhibiting three projecting longitudinal ridges.

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(1) Fleming calls them Coriudo; Lesueur, Dermochelis.

(2) Add *Dermochelis atlantica*, Lesueur.

CHELYS, Dum.(1)

The Chelydes resemble fresh water Tortoises in their feet and nails; their envelope is much too small to contain their head and feet, which are very large, and their nose is lengthened out into a small snout; their most dominant character, however, consists in their mouth, which opens crosswise, being unarmed with the horny beak common to the other Cheloniæ, and similar to that of certain Batrachians, the *Pipa* in particular.

Test. fimbria, Gm.; *La Matamata;* Brug. Journ. d'Hist. Nat. I, xiii; Schœpf. xxi. The shell studded with pyramidal elevations, and the body edged all round with a pinked fringe. It is found in Guiana.

TRIONYX, Geoff.

The Soft-shelled Tortoises have no scales, the shell and sternum being simply enveloped by a soft skin; neither of those shells is completely supported by bones, as the ribs do not extend to the edge of the upper one, and are united with each other only for a portion of their length, the parts analogous to the sternal ribs being simple cartilage, and the sternal pieces partially notched as in the sea-tortoises, not covering the whole lower surface. After death, the very rough surface of the ribs may be perceived through the dried skin. Their feet, like those of the fresh-water Tortoises, are palmated without being lengthened, but only three of their toes are possessed of nails. The horn of their beak is invested externally with fleshy lips, and their nose is prolonged into a little snout. Their tail is very short. They live in fresh water, and the flexible edges of their shell aid them in swimming.

Trionyx ægyptiacus, Geoff. Ann. du Mus. XIV, 1; *Test. triunguis*, Forsk and Gmel. (The Tyrse), is sometimes three feet in length, and of a green colour spotted with white; its shell is but slightly convex. It devours the young Crocodiles the moment they leave the egg, and is thus of more utility to Egypt than the Ichneumon.(2)

Test. ferox, Gm.; Phil. Trans., LXI, x, 1—3; cop., Lacep. I, vii; Schœpf. xix (The Soft-shelled Tortoise of America), inhabits the rivers of Carolina, Georgia, the Floridas, and of Guiana. It remains in ambush under roots of reeds, &c. whence it seizes birds, reptiles, &c., devours the young Alligators, and is devoured in turn by the old ones. Its flesh is highly esteemed.(1)

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(1) Merrem prefers calling this genus by the barbarous name of MATAMATA.

(2) Sonnini, Voy. en Egypte, tom. II, p. 333.

ORDER II.

SAURIA.(2)

The Saurians have a heart like that of the Cheloniæ, composed of two auricles and a ventricle, sometimes divided by imperfect partitions.

Their ribs are movable, partly connected with the sternum, and rise and fall in respiration.

Their lung extends more or less towards the posterior extremity of the body; it frequently penetrates very far into the lower part of the abdomen, whose transverse muscles pass under the ribs, and even towards the neck, to clasp it. Those in which this organ is very large, possess the singular faculty of changing the colours of their skin according to the excitement produced in them by their wants or passions.

Their eggs are enveloped by a covering more or less hard, and the young always retain the form in which they quit them.

Their mouth is always armed with teeth, and their toes, with very few exceptions, are furnished with nails; their skin is covered with scales, more or less compact, or at least with scaly granules. They all have a tail more or less long, and generally very thick at base: most of them have four legs, a few only having but two.

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(1) Add *Trionyx javanicus*, Geoff. Ann. du Mus. XIV;—*Tr. carinatus*, Id.;—*Tr. stellatus*, Id.;—*Tr. euphraticus*, Olivier, Voy. en Turquie, &c. pl. xlii;—*Tr. gangeticus*, Duvaucel;—*Tr. granosus*, Leach, or *Test. granosa*, Schœpf. xxx, A and B.

N.B. The *Tortue de Bartram*, Voy. Am. Sept. tr. fr. I, pl. 2, appears to me to be the *T. ferox*, to which, through a mistake, two nails too many have been added to each foot.

(2) From σαυρος, (Lizard) animals analogous to Lizards.

Linnæus included them all in two genera, the DRAGONS and the LIZARDS: but it has been found necessary to divide the latter into several, which so far differ in the number of feet, &c. the shape of the tongue, tail and scales, that we are even compelled to distribute them in several families.

FAMILY I.

CROCODILIDA.

This family contains the single genus

CROCODILUS, Br.

Crocodiles are large animals, with a tail flattened on the sides, five toes before and four behind, of which only the three internal ones on each foot are armed with nails, all more or less united by membranes; a single range of pointed teeth in each jaw; the tongue fleshy, flat, and adhering close to its edges; a circumstance which induced the ancients to believe that they had none; the back and tail covered with very stout, large, square scales or plates, relieved by a ridge along their middle; a deeply notched crest on the tail, which is double at its base. The plates on the belly are smooth, thin, and square. Their nostrils, which open on the end of the muzzle by two small crescent-shaped fissures closed by valves, communicate with the extremity of the hind part of the mouth, by a narrow canal which traverses the palatine and sphenoidal bones.

The lower jaw being continued behind the cranium, the upper one appears to be movable, and has been so described by the ancients; it only moves, however, with the entire head.

They have the power of closing the external ear by means of two fleshy lips, and there are three lids to their eyes. Six small holes, orifices of as many glands, may be observed under the throat, from which issues a kind of musk-scented pomatum.

The vertebræ of the neck rest on each other through the medium of small false ribs, which renders all lateral motion difficult, and does not allow these animals to deviate suddenly from their course; consequently it is easy to escape from them by pursuing a zig-zag direction, or by running round them. They are the only Saurians that are destitute of clavicles, but their coracoid apophyses are attached to the sternum, as in all the others. In addition to the common and false ribs, there are others which protect the abdomen, without reaching to the spine, and which appear to be produced by the ossification of the tendinous inscriptions of the recti muscles.

Their lungs do not dip into the abdomen like those of other reptiles, and some fleshy fibres, adhering to that part of the peritoneum which covers the liver, give them the appearance of a diaphragm, which, in conjunction with the division of their heart into three chambers, where the blood from the lungs does not mingle so perfectly with that from the body as in other reptiles, appproximates them somewhat nearer to the hot-blooded quadrupeds.

The tympanum and pterygoid apophyses are fixed to the cranium as in the Tortoises. Their eggs are as large and hard as those of a Goose; and Crocodiles are considered, of all animals, those which present the greatest difference in size. The females keep careful watch over their eggs, and tenderly protect their young for some months. They inhabit fresh water, are extremely ferocious and carnivorous, cannot swallow under water, but drown their prey, and place it in some submerged crevice of a rock, where they allow it to putrefy before they eat it.(1)

The species, which are more numerous than they were thought to be previous to my observations, are referable to three distinct subgenera.

Gavial, Cuv.

The muzzle slender and very long; the teeth nearly equal; the fourth ones below passing, when the jaws are closed, into notches, and not into holes, in the upper one; the external edges of the hind feet are notched, and the feet themselves palmated to the very ends of the toes; two large holes in the bones of the cranium behind the eyes may be felt through the skin. They have as yet been found in only the eastern continent. The most common is,

> *Lac. gangetica*, Gm.; *Gavial du Gange;* Faujas, Hist. de la Mont.' de St Pierre, pl. xlvi; Lacep. I, xv. A species which attains a great size, and which, besides the length of its muzzle, is remarkable for a stout cartilaginous prominence which encircles its nostrils, and then inclines backwards.(2)

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(1) Crocodiles differ so much from Lizards that several authors have recently thought it proper to form them into a separate order. They are the LORICATA, Merrem and Fitzinger; the EMYDOSAURIA, Blainv.

(2) This prominence is the foundation of Ælian's remark (Hist. an. LXII, c. 41), that the Ganges produces Crocodiles which have a horn on the end of the muzzle. See its figure and description by Geoff. St Hillaire, Mém. du Mus. XII, p. 97.

Add, the *Petit Gavial* (*Croc. tenuirostris*, Cuv.), Faujas, loc. cit. pl. xlviii, should it prove to be a distinct species.

N.B. The calcareous schist of Bavaria has produced a small fossil Gavial of a

CROCODILES,(1) properly so called.

Have an oblong and depressed muzzle, unequal teeth, the fourth ones below passing into notches, and not into holes of the upper jaw, and all the remaining characters of the preceding subgenus. They are found in both continents.

Lac. crocodilus, L.; *Crocodile du Nil*, Geoffr. Descr. de l'Egypte, Rep. II, 1; Ann. Mus. X, iii, 1; Cuv. Ib. X, pl. 1, f. 5 and 11, f. 7, and Oss. foss. V, part 2, same plate and figure (The Crocodile of the Nile), so celebrated among the ancients, has six rows of square and nearly equal plates along the whole length of the back.(2)

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peculiar species, described by Sœmmering in the Mem. of the Acad. of Munich, of 1814.

I have described the crania and other parts of fossil Crocodiles allied to the Gavials found at Caen, Honfleur and other places, and marked those points in which the osteology of their cranium differs from that of the Gavial now in existence. See Oss. foss. V, part 2. Similar observations have also been made in England by M. Conybeare. In consequence of these differences, which all relate to the hind part of the palate, M. Geoffroy has thought proper to form two genera of these lost animals, which he calls THELEOSAURUS and STENEOSAURUS, notwithstanding which, he appears to think they may be the stock of the present Gavials, and that the said differences may have resulted from atmospheric changes. Mem. du Mus., XII.

(1) Κροκοδειλος, *which fears the shore*, a name given by the Greeks to a common Lizard of their country; they afterwards, in their travels through Egypt, applied it to the Crocodile from the mutual resemblance. Herodot. Lib. II. Merrem has changed the name of this subgenus to that of CHAMPSES, which, according to Herodotus, was the Egyptian name of this animal.

(2) From the Senegal to the Ganges, and beyond it, we find Crocodiles very similar to the common one, some of which have a rather longer and narrower muzzle, and others, a difference in the plates or scales which cover the top of their neck; but it is very difficult to arrange them as distinct species, on account of their intermediate gradations. The small insulated scales which form a transverse row immediately behind the cranium, vary from two, to four and six; the approximated scales which compose the shield of the neck are generally six in number, but sometimes there is a smaller one at but little distance from each of the anterior angles of this shield, and at others it is contiguous to it, in which case it (the shield) consists of eight plates or scales. M. Geoffroy calls those which have a longer and narrower muzzle, *Croc. suchus;* those whose row of scales behind the cranium consists of six pieces, *Croc. marginatus.*, among which some have six plates in the shield, and others eight; *Croc. lacunosus*, an individual specimen which only presented two scales behind the cranium, and six plates in the shield; and, finally, another specimen whose characters are referable to some proportions of the head, *Croc. complanatus*.

These various Crocodiles also differ in some of the details of the form of the muzzle, and in the lateral scales of the back, but as regards this, and the muzzle particularly, the varieties are still more numerous, and M. Geoffroy acknowledges that *nothing is more fugitive than the forms of Crocodiles*. This is so much the case, *Croc. biporcatus*, Cuv.; *Le Crocodile à deux arêtes*, Ann. Mus. X, I, 4 and 11, 8, and Oss. foss. 2d part, same plates and fig., has eight rows of oval plates along the back, and two projecting crests on the upper part of the muzzle. It is found in several islands of the Indian Ocean, and most probably exists in the two peninsulas.

Croc. acutus, Cuv.; *Crocodile à museau effilé*, Geoff. Ann. Mus. II, xxxvii, has a longer muzzle, arched at base; the dorsal plates arranged in four lines; the external ones disposed irregularly, and with more salient ridges. From St Domingo and the other great Antiles. The female places her eggs under ground, and uncovers them at the moment they are about to be hatched.(1)

ALLIGATOR, Cuv.(2)

Alligators have a broad obtuse muzzle and unequal teeth, the

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that I dare not elevate the Crocodiles sent from Bengal by M. Duvaucel to the rank of species, although they have a more convex head than any of the others.

There is another point in which I am compelled to differ from the learned naturalist I have just named. He supposes that the variety or species with the narrow muzzle remains smaller, is gentle and inoffensive, and that the smallness of its size causes it to be soonest thrown upon the shores by inundations, of which it is thus the precursor, and, from these ideas, is of opinion that it was the object of the religious honours of the Egyptians, and that *Suchus*, or *Suchis*, was its specific appellation. On the contrary, I think I have proved, both by Aristotle and Cicero, that the Crocodiles venerated by the Egyptians were not less ferocious than the others; it is also very certain, that the species with the narrow muzzle was not the exclusive object of priestly care, for, from the very exact researches of M. Geoffroy himself, it appears that the three embalmed Crocodiles now in Paris are not the *Suchus*, but the *complanatus*, the *marginatus*, and the *lacunosus;* in fine, I am forced to believe that *Souc*, or *Souchis*, which, according to M. Champollion, was the Egyptian name of Saturn, was also the specific name of the Crocodile fed at Arsinoe, just as *Apis* was the name of the sacred bull at Memphis, and *Mnevis* that of the bull of Hermopolis. With respect to this point of ancient history, see the various writings of M. Geoffroy, and particularly in the great work on Egypt, as well as my Oss. foss. tom. V, part 2, p. 45. This last article having been written previous to that of the great work on Egypt, I could not profit by the argument drawn from the difference of the embalmed Crocodiles, an argument furnished me by M. Geoffroy, and one which seems to me strongly to corroborate my view of the matter.

(1) The *Croc. acutus* has been particularly observed by M. Descourtils.—Add the *Croc. rhombifer*, Cuv. Ann. Mus. XII, pl. 1, 1;—the *Croc. à casque* (*C. galeatus*). Perrault, Mém. pour servir a l'Hist. des An. pl. lxiv, if it should prove (being only known by this figure) a constant species;—the *Croc. biscutatus*, Cuv. Ann. Mus. X, 11, 6, and Oss. foss., t. V, part 2, pl. 11, f. 6, of which only one or two specimens have ever been seen;—the *Croc. cataphractus*, Cuv. Oss. foss. V, part 1, pl. v, f. 1 and 2.

(2) Or *Caïman*, the name given to Crocodiles by the negroes of Guinea. The

fourth lower ones entering into holes in the upper jaw, and not into notches; their feet are only semi-palmate and without emargination. They have hitherto only been certainly found in America.

Croc. sclerops, Schn.; Seb. I, civ, 10; Cuv. Ann. Mus. X, 1, 7 and 16 and 11, 3 (The Spectacle Alligator), so named from a transverse ridge, which unites in front the salient borders of its orbits, is the most common species in Guiana and Brazil. Its neck is defended by four transverse bands of strong plates. The female lays in the sand, covers her eggs with straw or leaves, and defends them courageously.(1)

Croc. lucius, Cuv.; *Caiman à museau de brochet*, Ann. Mus. X, 1, 8 and 15, and II, 4, so called from the shape of its muzzle, is also distinguished by four principal plates on its neck. It inhabits the southern parts of North America, forces itself into the mud in severe winters, and remains torpid. The female deposits her eggs in alternate layers with beds of earth.(2)

French colonists employ it to designate the species of Crocodile most common about their plantations. The word *Alligator* is used by the English and Dutch colonists in the same sense. It is a corruption of the Portuguese word *Lagarto*, which is itself derived from *Lacerta*.

(1) There are also several sorts of Caimans or Alligators, which have this transverse ridge front of the orbits, and which, like the Crocodiles, allied to the common one, perhaps form distinct species, but difficult to characterize.

Some of them have a shorter and more rounded muzzle; the transverse ridge concave before, and extending to the cheek on each side. They have thirteen teeth on each side above; their cranium is not widened behind; their body is green dotted, and spotted with black, with black bands on the tail.

Others have the same kind of head and the same teeth, but their body is black, with narrow bands that are yellowish, as in the *Jacaré noir*, Spix, pl. iv.

Others again have a muzzle less broad, and the concave ridge does not extend so far: they have fifteen teeth, and their neck is more completely defended by plates; I should willingly consider them as the *Cr. fissipes* of Spix, pl. iii.

Finally, there are some with a still narrower muzzle, and the cranium somewhat widened behind, whose transverse ridge is convex in front, and does not extend on the cheek; the ridge of their dorsal plates is less salient, and the bands on their tail are more faintly marked: can they be the *Cr. punctulatus* of Spix, pl. ii? That gentleman, unfortunately, has not insisted upon the characters drawn from the transverse ridge.

(2) See the paper of Dr Harlan, Ac. of Nat. Sc. of Philad. IV, 242.—Add the *Caïman à paupières osseuses*, (*Croc. palpebrosus*, Cuv.) Ann. Mus. X, pl. 1, 6 and 7 and 11, 2; and the *Croc. trigonatus*, Schn., Seb., I, cv, 3; or the *Jacaretinga moschifer*, Spix, pl. i. The whole thickness of the eye-lid in this species is occupied by three osseous lamellæ, of which, in other Crocodiles, there is scarcely a vestige.

FAMILY II.

LACERTINIDA.(1)

This family is distinguished by the tongue, which is thin, extensible, and terminates in two threads, like that of the Coluber and Viper; the body is elongated; the walk rapid; each foot has five toes separate and unequal, the hind ones particularly so, all armed with nails; the scales on the belly and round the tail are arranged in transverse and parallel bands; the tympanum is level with the head, or but slightly sunk and membranous. A production of the skin with a longitudinal slit which is closed by a sphincter, protects the eye, under whose anterior angle is the vestige of a third eye-lid; the false ribs do not form a complete circle; the male organs of generation are double, and the anus is a transverse slit.

The species being very numerous and various, we subdivide them into two great genera.

MONITOR, by a singular error called TUPINAMBIS.(2)

This genus contains species of the largest size; they have two teeth in both jaws, but none in the palate; the greater number are recognized by their laterally compressed tail, which renders them more aquatic. The vicinity of water sometimes brings them in the neighbourhood of Crocodiles and Alligators, and it is said that by whistling they give notice of the approach of these dangerous animals. This report is most probably the origin of the term *Sauvegarde* or *Monitor* applied to some of their species, but the fact is very uncertain. They are divided into two very distinct groups. The first, or that of the

MONITORS, properly so called,

Is known by numerous and small scales on the head and limbs, under the belly and round the tail; on the top of the latter is a carina formed by a double row of projecting scales. The range of pores observed on the thighs of several other Saurians is not found in these. They are all from the eastern continent.(1) Two species are found in Egypt which may be considered as the types of two subdivisions.

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(1) *Lacerta*, a Lizard.

(2) Marcgrave, speaking of the Sauvegarde of America, says that it is called *Teyu-guaçu*, and among the Tupinambous, *Temapara* (*Temapara tupinambis*). Seba has mistaken the latter name for that of the animal, and all other naturalists have copied it from him.

Lac. nilotica, L.; *Monitor du Nil.; Ouaran* of the Arabs; Mus. Worm. 313; Geoff. St. Hil., great work on Egypt; Rep. pl. 1, f. 1. Strong conical teeth, the posterior of which become rounded by age; brown, with pale and deeper coloured dots, forming various compartments, among which we observe transverse rows of large ocellated spots that become rings on the tail. The latter round at base is traversed above by a carina which extends almost from root to tip. It attains a length of five and six feet. The Egyptians pretend it is a young Crocodile hatched in a dry place. It was engraved upon the monuments of that country by its ancient inhabitants, and possibly, because it devours the eggs of the Crocodile.(2) The other species,

Lac. scincus, Merr.; *Monitor terrestre d'Egypte; Ouaran el hard* of the Arabs, Geoffr. Egypt. Rept. III, f. 2, has compressed, trenchant, and pointed teeth; the tail almost without a keel and round much farther from the root; its habits are more terrestrial, and it is common in the deserts in the vicinity of Egypt. The jugglers of Cairo, after extracting its teeth, employ it in their art. It is the *Land Crocodile* of Herodotus, and as Prosper Albin remarks, the true Scincus of the ancients.(3)

India and Africa produce a great number of Monitors with trenchant teeth like those of the preceding species, but whose tail is more compressed than even that of the *Lac. nilotica.* The one most common in the Indian archipelago is the

Lac. bivittata, Kuhl, which is white above, black beneath, with five transverse rows of white spots or rings. A white band extends along the neck, and there is an angle formed by the white on the breast which reaches obliquely over the shoulder. Specimens have been found three feet in length.(1)

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(1) Seba, and from him Daudin, describe some true Monitors as American; it is a mistake.

(2) To this species, both by the form of the teeth and the arrangement of the spots, which, by-the-bye, are similar in almost all the Monitors, must be referred the *M. orné* (*M. ornatus*, Daud.), Ann. Mus. II, xlviii, *Lac. capensis*, Sparm. and the *M. albogularis*, Daud. Rept. III, pl. xxxii.

It is from this subdivision that M. Fitzinger has made his genus VARANUS, under which name Merrem comprized all the Monitors.

(3) This species constitutes the genus PSAMMOSAURUS of M. Fitzinger.

In the other group of the Monitors, there are angular plates on the head, and large rectangular scales on the belly and round the tail. The skin of the throat, covered with small scales, is doubled into two transverse folds. There is a row of pores on the under part of their thighs.(2) This group is also susceptible of subdivisions: the first forms the genus

CROCODILURUS, Spix,(3)

Whose distinguishing character consists in scales relieved by ridges, as in the Crocodiles, forming crests on the tail, which is compressed.

Mon. crocodilinus, Merr.; *La Grande Dragonne*, Lacep. Quadr. Ovip. pl. ix, has ridged scales scattered also along the back. Its back teeth become rounded with age. It attains a length of six feet, and lives in burrows near marshes. Found in Guiana, where its flesh is eaten.

Lac. bicarinata, L.; *Le Lezardet*, Daud.; *Crocodilurus amazonicus*, Spix, pl. xxi, is smaller, and has none of the aforesaid kind of scales on the back. It is found in several parts of South America. In the second, or

SAUVEGARDES, Cuv.—TEIUS, Merr.

None of the scales of the back and tail carinate: the teeth are notched, but with age the back ones also become rounded.(4)

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(1) With this species, from the distribution of colours, are connected the *T. bigaré*, Daud. (*Lac. varia*, Shaw, Nat. Misc. 83, J. White, 253);—a neighbouring species of Manilla (*M. marmoratus*, C.):—the *T. elegant* and the *T. etoilé*, Daud. III, xxxi, and Seb., I, xcxiv, 1, 2, 3, xcxviii, xcix, 2; II, xxx, 2, xc, cv, 1, &c. all of which are but one species, originally from Africa. We must add the *T. cepedien*, Daud. III, xxiv, or *Lac. exanthematica*, Bosc., Act. Soc. Nat. Par. pl. v, f. 3, ocellated throughout;—the M. dotted with brown of Bengal (*M. bengalensis*, Daub.);—the black M. spotted with green of the Moluccas (*M. indicus*, Daud.);—a species of a uniform black from Java, *M. nigricans*, Cuv., &c.

All things considered, I have now reason to believe that the fig. of Seba, I, pl. ci, f. 1, of which Linnæus made his *Lacerta dracæna*, but which is very different from the *Dragonne* of Lacep., is the *M. bengalensis*. Seba's original is in the Museum.

To these species with a compressed tail, M. Fitzinger applies the generic name of TUPINAMBIS.

(2) Merrem has made his genus TEIUS from this second group.

(3) M. Gray has changed this name into ADA.

(4) It is to such that M. Fitzinger particularly applies the name of MONITOR.

Some of them, more particularly termed SAUVEGARDES, have a tail that is more or less compressed; the scales on the belly are longer than they are broad. They live on the banks of rivers, &c. Such is

Lac. teguixin, Lin. and Shaw; *Le Grande Sauvegarde d'Amerique; Teyu-guazu; Témapara*, &c.; Seb. I, xcvi, 1, 2, 3, xcvii, 5, xcix, 1. Yellow dots and spots disposed in transverse bands, on a black ground above, and a yellowish one beneath; yellow and black bands on the tail.(1) Found in Guiana, where it attains the length of six feet. It moves rapidly on shore, and when pursued hastens to the water for refuge, where it dives, but does not swim. It feeds on insects, reptiles, eggs, &c., and lays in holes which it excavates in the sand. Both flesh and eggs are edible.(2)

Others, called AMEIVAS(3) only differ from the preceding in the tail, which is round, and nowise compressed, furnished, as well as the belly, with transverse rows of square scales; those on the belly are more broad than long. They are American Lizards, tolerably similar, externally, to those of Europe; but besides the want of molars, most of them have no collar, and all the scales of the throat are small; their head also is more pyramidal than that of the European Lizards, and they have not, like the latter, a bony plate on the orbit.

Several species have been confounded under the name of *Lacerta ameiva*, some of which it is still very difficult to distinguish. The most common, *Teyus ameiva*, Spix, XXIII; Pr. Max. de Wied. liv. V, is a foot long or more; green; the back more or less dotted and spotted with black, and vertical rows of white ocellated spots bordered with black, on the flanks.

There is another, *Teyus cyaneus*, Merr.; Lacep., I, xxxi, Seb. II, cv, 2, about the same size, of a bluish colour, with round white spots scattered over the flanks and sometimes on the body. The young of these animals, and of some others of the same subdivision, have blackish stripes on the sides of the back, a fact worth remembering to avoid an undue multiplication of species.(1)

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(1) Dried specimens, or those preserved in spirits, assume a greenish or bluish tint in those parts where the colours are light, and it is thus that they are represented by Seba; but while alive, and as we have seen it, the light parts are more or less yellow. Pr. Max. de Wied has given a good picture of it in his eleventh No.

(2) Add the *Tupin. à taches vertes* of Daud., if it be not a simple variety of Sauvegarde. Spix calls it *Tup. monitor*, pl. xix; it is his *T. nigropunctatus*, which is the true Sauvegarde.

(3) According to Marcgrave, the term *Ameiva* designates a Lizard with a forked tail, a circumstance which can only be the result of accident; Edwards having had in his possession an individual of the above division, in which this accident was observed, applied that term to the whole species. Marcgrave compares his individual to his *Taraguira*, which, from his description, is rather a *Polychrus*.

We may separate from the Ameivas certain species, all the scales of whose belly, legs, and tail, are carinated(2) and others in which even those on the back are similarly relieved, so that the flanks only are granulated.(3) A collar under the neck also approximates these species to the lizards.(4) The

LACERTA, properly so called,

Or true Lizards, form the second genus of the Lacertians. The extremity of their palate is armed with two rows of teeth, and they are otherwise distinguished from the Ameivas and Sauvegardes by a collar under the neck, formed of a transverse row of large scales, separated from those on the belly by a space covered with small ones only, like those under the throat; and by the circumstance that a part of the cranium projects over their temples and orbits, so as to furnish the whole top of the head with a bony buckler.

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(1) Such, it appears to me, is the *Teyus ocellifer*, Spix, xxv.

Add the *Am. litterata*, Daud. Seb., I, lxxxiii;—*Am. cœruleocephala*, Id. Seb. I, xci, 3;—*Am. lateristriga*, Cuv. Seb. I, xc, 7;—*Am. lemniscata* (*Lacert. lemnis*, Gm.), Seb. I, xcii, 4;—*Teius tritæniatus*, Spix, xxi, 2;—*T. cyanomelas*, Pr. Max. Liv. v. [Add *Am. sex-lineata*, Catesb. 68. *Am. Ed.*]

It is impossible to say from what confusion of synonymes Daud. has placed the *Am. litterata* in Germany; like all the others, it is from America. The *Am. graphique*, Daud. Seb. I, lxxxv, 2, 4, is the Dotted Monitor; his *Am. argus*, Seb. I, lxxxv, 3, is the *Mon. cepedien;* his *goitreux*, Seb. II, ciii, 3, 4, does not differ from the litterata; finally, his *tête rouge*, Seb. I, xci, 1, 2, is a common Green Lizard. He was probably led into error by the coloured plates of Seba. The *Lac. 5-lineata* appears to me to be a *L. cœruleocephala*, a part of whose broken tail had grown again with small scales, as is always the case when that accident happens; the axis of this new portion of the tail is always, also, a cartilaginous stem without vertebræ. It is impossible to characterize species by similar accidental circumstances, as Merrem has done in his *Teyus monitor* and *cyaneus*.

(2) In one sex of one of these species, there are two small spines on each side of the anus, which circumstance gave rise to the genus CENTROPYX of Spix, XXII, 2.

(3) The *Lezard strié of Surinam*, Daud., III, p. 347, of which Fitzinger makes his genus PSEUDO-AMEIVA.

(4) It appears to me that even the Centropyx has palatine teeth; these two sorts of Lizards, however, have the head of an Ameiva, no bone on the orbit, &c. N.B. Fitzinger makes a genus (TEYUS) of the *Lézard teyou*, Daud. which should have but four toes to the hind feet; its only foundation, however, is an imperfect description of Azzara, and it does not seem to me sufficiently authentic.

They are very numerous. Europe produces several species confounded by Linnæus under the name of *Lacerta agilis*. The most beautiful is the *Grand Lézard vert ocellé*,—*Lac. ocellata*, Daud.; Lacep., I, xx; Daud. III, xxxiii, from the south of France, Spain, and Italy. It is more than a foot long, with lines of black dots, forming rings or eyes and a kind of embroidery; the young according to M. Edwards is the *Lezard gentil*, Daud., III, xxxi. The *Lac. viridis*, Daud., III, xxxiv, of which the *Lac. bilineata*, Id. xxxvi, 1, according to the same gentleman, is a variety;—the *Lac. sepium*, Id. Ib. 2, of which the *Lac. arenicola*, Id., xxxviii, 2, is a variety;—and the *Lac. agilis*, Id., xxxviii, 1, are found in the environs of Paris. The south of France produces the *Veloce*, Pall., to which must be referred the *Vosquien*, Daud. xxxvi, 2, and some new species.(1)

Algyra, Cuv.

The tongue, teeth, and femoral pores of the Lizards, but the scales of the back and tail are carinated, those of the belly smooth and imbricated. The collar is wanting.(2)

Tachydromus,(3) Daud.

Square and carinated scales on the back, under the belly, and on the tail; no collar nor femoral pores, but on each side of the anus is a small vesicle opening by one of the latter. The tongue still like that of the Lizards, and the body and tail very much elongated.

FAMILY III.

IGUANIDA.(4)

This third great family of Saurians possesses the general form, long tail, and free and unequal toes of the Lacertians;

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(1) I add, but with hesitation, the *Lac. cericea*, Laur., 11, 5; *argus*, Id. 5; *terrestris*, Id., III, 5. The *tiliguerta* of Daudin is made up of an American Ameiva and the green Lizard of Sardinia, from a bad description by Cetti. The *cæruleocephala*, the *lemniscata*, the *quinquelineata*, are *Ameivas*. The *sexlineata*, Catesb., XLVIII, is a Seps.

N.B. With due submission to our author, this appears to be a mistake, the *sexlineata*, Catesb., is most certainly an Ameiva. *Am. Ed.*

(2) *Lac. alegyra*, Lin.

(3) Ταχυς and δρωμον, Quick-runner.

(4) *Iguane*, a name according to *Hernandéz*, *Scaliger*, &c. originating in St Do-

their eye, ear, &c. are also similar, but their tongue is fleshy, thick, non-extensible, and only emarginated at the tip.

They may be divided into two sections; in the first, or that of the AGAMIANS, there are no palatine teeth. In this section we place the following genera,

STELLIO, CUV.

In addition to the general characters of the family of the Iguanida, the tail is encircled by rings composed of large and frequently spiny scales. The subgenera are as follows:

CORDYLUS, Gronov.(1)

The tail, belly and back covered with large scales arranged in transverse rows. The head, like that of the common lizards, is protected by a continuous bony buckler, and covered with plates. In several species the points of the scales on the tail form spiny circles; there are small spines also to those on the sides of the back, on the shoulders, and outsides of the thighs, on which latter there is a line of very large pores.

The Cape of Good Hope produces several species long confounded under the name of *Lacerta cordylus*, L. These Saurians, whose armour so completely defends them, are a little larger than the common Green Lizard of Europe, and feed on insects.(2)

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mingo, whose inhabitants must have pronounced it *Hiuana*, or *Igoana*. According to Bontius it originated in Java, where the natives call it *Leguan*. In this case the Portuguese and Spaniards carried it to America transformed to *Iguana*. They apply it there now to a *Sauvegarde*, as a true *Iguana*. This name, as well as that of *Guano*, has occasionally been given to Monitors of the eastern continent. The reader of travels should bear this in mind; I even consider the *Leguan* of Bontius as a Monitor.

(1) According to Aristotle, "the *Cordylus* is the only animal possessing feet and branchiæ. It swims with its feet and tail, the latter of which, as far as large things can be compared with small, is similar to that of a Silurus. This tail is soft and broad. It has no fins: it lives in marshes, like the Frog: it is a quadruped, and leaves the water: sometimes it is dried up and dies."

It is evident that these characters can only belong to the larva of the aquatic Salamander, as M. Schneider has very justly observed. Belon has described this Salamander by the name of *Cordyle*, but his printer, by mistake, annexed to it the figure of the *Lac. nilotica*, L. Rondelet has applied this name to the great *Stellio of Egypt*, or *Caudiverbera* of Bélon, mistaking the ear, in the figure, for a gill opening. Between *Rondelet* and *Linnæus*, then, *Cordylus* has passed for the synonyme of the *Caudiverbera*. Its special application to the above subgenus is altogether arbitrary. Merrem has changed it to ZONURUS.

(2) Daudin has referred several synonymes of Stellio to Cordylus, just as he has

STELLIO, Daud.(1)

The spines of the tail moderate: the head enlarged behind by the muscles of the jaws; the back and thighs bristled here and there with scales larger than the others, and sometimes spiny; small groups of spines surrounding the ear; no pores on the thighs; the tail long, and terminating in a point. But one species is known.

> *Lac. stellio*, L.; the Stellio of the Levant; Seb. I, cvi, f. 1, 2; and better Tournef. Voy. au Lev. I, 120; and Geoff. Descr. de l'Egypte, Rept. II, 3; *Koscordylos* of the modern Greeks; *Hardun* of the Arabs. A foot long; of an olive colour shaded with black; very common throughout the Levant, and particularly so in Egypt. According to Bélon it is the fæces of this animal which are collected for the druggists under the names of *cordylea*, *crocodilea* or *stercus lacerti*, which were formerly in vogue as a cosmetic; but it would rather appear that the ancients attributed this name and quality to those of the Monitor. The Mahometans kill the present Stellio wherever they see it, because, as they say, it mocks them by bowing the head, as they do when at prayer.

DORYPHORUS, Cuv.

The pores wanting as in the Stellios, but the body is not bristled with small groups of spines.(2)

UROMASTIX,(3) Cuv.—STELLIONS BATARDS, Daud.

Mere Stellios, whose head is not enlarged, all the scales of their

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referred to Stellio several synonymes of the *Geckotte*. There are four species in France: *Cord. griseus*, Nob., Seb. I, lxxxiv, 4;—the *C. niger*, the ridges of whose scales are more blunt, Seb., II, lxii, 5;—the *C. dorsalis*;—the *C. microlepidotus*.

There are also some Cordyles at the Cape of G. Hope, whose scales, (even those on the tail) are almost destitute of spines (*C. lævigatus*, Nob.).

(1) The Stellio of the Latins was a spotted Lizard that lived in holes of walls. It was considered the enemy of man, venomous and cunning. Hence the term *stellionate*, or *Fraud in the contract*. It was probably the *Tarentole*, or the *Gecko tuberculeux* of the south of Europe, *Geckotte* of Lacep., as conjectured by various authors, and lately by M. Schneider. There is nothing to justify its application to the present species; Bélon, if I am not mistaken, was the first who abused it thus.

(2) *Stellio brevicaudatus*, Seb., II, lxxii, 6; Daud., IV, pl. 47.—*St. azureus*, Daud., Id. 46.

(3) *Caudiverbera* and κρομαςιξ are not ancient names. They were coined by Ambrosinus for the great Egyptian species, of which Bélon had said "*cauda atrocissime diverberare creditur.*" Linnæus was the first who applied it to a Gecko, and

body being small, smooth and uniform, and those of the tail still larger and more spiny than in the common Stellio; but there are none beneath. There is a series of pores under their thighs.

> *Stellio spinipes*, Daud.; *Fouette-queue d'Egypte*, Geoff. Rept. d'Egyp. pl. II, f. 2. Two or three feet long; the body inflated; altogether of a fine grass green; small spines on the thighs; the tail only spiny above. Found in the deserts which surround Egypt; it was formerly described by Bélon, who says, but without adducing proof, that it is the terrestrial Crocodile of the ancients.(1)

AGAMA, Daud.(2)

The Agamæ bear a great resemblance to the common Stellios, particularly in their inflated head; but the scales of their tail, which are imbricate and not verticillate, distinguish them from that genus. Their maxillary teeth are nearly similar, and there are none in the palate. In the

COMMON AGAMA,

The scales are raised in points or tubercles; spines either singly or in groups bristle on various parts of the body, the vicinity of the ear especially. A row of them is sometimes found on the neck, but without forming that palisado-like crest which characterizes the Calotes. The skin of the throat is lax, plaited transversely, and susceptible of being inflated.

In some species are found femoral pores. The

> *Ag. barbata*, N. is very remarkable for its size and extraordinary figure; a suite of large spiny scales extend along its back and tail in transverse bands, and approximate it to the Stellios.

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other authors have given it to different Saurians. Add *Urom. griseus* of New Holland;—*Ur. reticulatus* of Bengal;—*Ur. acantinurus*, Bell. Zool. Jour., I, 457, if it be a distinct species.

N.B. The flat-tailed Stellio of New Holland, Daud. is a Phyllurus.

(1) It is a Uromastix that is described by M. de Lacep. Rept. II, 497, under the name of *Quetzpaleo*, which is that of another Saurian, to be spoken of hereafter.—Add, *Ur. ornatus*, Ruppel.

(2) *Agama*, from αγαμος, bachelor. Why Linnæus gave this name to one of these Lizards, it is impossible to conjecture; Daudin has extended it to the whole of the subgenus to which this species belongs, and thinks that *Agama* is the name given to it in the country of which it is a native.

A new species called *torquata* has lately been described by Messrs Peale and Green, Jour. Acad. Nat. Sc. Philad. Vol. VI, p. 231, from Mexico, which they consider as approaching the *nigricollis*, Spix. *Am. Ed.*

The throat, which can be greatly inflated, is covered with elongated and pointed scales, which constitute a sort of beard. Similar scales bristle on the flanks, and form two oblique crests behind the ears; yellowish spots edged with black under the belly. We must not confound with it the

Lac. muricata, Sh.; the *Muricated Agama* of the same country, Gen. Zool., Vol. III, part 1, pl. lxv, f. xi; White, p. 244, in which the raised scales are disposed in longitudinal bands, between which are two series of spots paler than the ground, which is a blackish brown. It usually attains a large size.

Other species have no femoral pores.

Ag. colonorum, Daud.; Seb. I, cvii, 3.(1) Brownish, with a long tail; a small row of short spines on the neck; from Africa, and not, as is asserted, from Guiana.

There is a smaller Agama at the Cape, with a moderate tail, varied with brown and yellowish, bristled above with raised and pointed scales, the *Ag. aculeata*, Merr.;(2) Seb., I, viii, 6, lxxxiii, 1 and 2, cix, 6; its belly sometimes assumes an inflated form, which leads to the

Tapayes—Agames Orbiculaires, Daud. in part,

Which are mere Agamæ, with an inflated abdomen and a short and thin tail. Such is

Lac. orbicularis, L.; *Tapayaxin* of Mexico, Hern. 327. The back is spinous, and the belly sprinkled with blackish points.(3)

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(1) Nothing can surpass the confusion in the synonymes quoted by authors with respect to the different species of Lizards, and chiefly of the *Agamæ*, *Calotes* and *Stellios*. As regards the *Agama*, for instance, Daudin quotes from Gmelin, Seb., I, cvii, 1 and 2, which are *Stellios;* Sloane, Jam., II, cclxxiii, 2, which is an *Anolis*, Edw. ccxlv, 2, which is also an *Anolis;* and the same fig. is again quoted by him and Gmel. for the *Polychrus*. Shaw even copies it to represent that same animal, with which it has nothing in common. Seb., I, cvii, 3, which is the true *Ag. colonorum*, Daud., is cited by Merrem as *Ag. superciliosa;* and Seb., I, cix, 6, which is his *aculeata*, is quoted as *orbicularis*, &c.

(2) The *Agame à pierreries*, Daud. IV, 410; Seb. I, viii, 6, is merely the young of this spiny Agama of the Cape, whose colours are more various than those of the adult. Add *l'Agame sombre* (*Ag. atra*), Daud., III, 349; rough, blackish; a yellowish line along the back;—the *Ag. ombre* (*Lac. umbra*) Daud., which is not the *Lac. umbra*, Lin. but distinguished from it by five lines of very small spines, which extend along the back, &c.

(3) I do not think the subgenus of the Tapayes can be preserved; the species of Hernandez (*Lac. orbicularis*, L.), Hern., p. 327, does not appear to differ from the *Agama cornuta* of Harlan, Phil. Ac. Nat. Sc. IV, pl. xlv, or, if at all, only from the sex. Daudin has put in its place, tom. III, pl. xlv, f. 1, the adult of the *Tap. ægyptius*.

TRAPELUS, Cuv.

The form and teeth of the Agamæ, but the scales are small and without spines; no pores on the thighs.

Trap. Ægyptius; Le Changeant d'Egypte, Geoff. Rep. d'Eg. pl. v, f. 3, 4; the adult, Daud. III, xlv, 1, under the name of *Orbiculaire,* is a little animal whose body is also sometimes inflated, and remarkable for changing its colours even more suddenly than the Chameleon. When young it is entirely smooth; there are some larger scales scattered among the small ones on the body of the adult.(1)

LEIOLEPIS, Cuv.

The teeth of an Agama, the head less inflated, and completely covered with very small, smooth, and compact scales. Pores on the thighs.(2) The

TROPIDOLEPIS, Cuv.

Still similar to the Agamæ in teeth and form, but regularly covered with imbricated and carinated scales. The femoral pores are strongly marked.(3) The

LEPOSOMA, Spix—TROPIDOSAURUS, Boié,

Only differs from Tropidolepis, by having no pores.(4)

CALOTES, Cuv.(5)

The Calotes differ from the Agamæ in being regularly covered with scales, arranged like tiles, frequently carinated and terminating in a point on the body as well as the limbs and tail, which is very long; those on the middle of the back are more or less turned up, and compressed into spines forming a crest of variable extent. They have no visible pores on the thighs, which, added to their teeth, distinguishes them from the Iguanæ.

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(1) It is difficult to establish precise limits between this subgenus and certain short, thick Agamæ, that have but few spines.

(2) There is a species in Cochin China that is blue, with white stripes and spots, and a long tail (*Leil. guttatus,* Cuv.).

(3) *Ag. undulata,* Daud., a species that is found throughout America, remarkable for a white cross under the throat, on a black-blue ground. The *Ag. nigricollaris,* Spix, XVI, 2, and *cyclurus,* XVIII, f. 1, are at least closely allied to it.

(4) Spix has not expressed himself with precision in saying that the scales of his *leposoma* are verticillate, and this it is which has deceived M. Fitzinger. The genus Tropidosaurus was made by Boié from a small species from Cochin China, which is in the Cabinet du Roi.

(5) Pliny says that the *Stellio* of the Latins was called by the Greeks *Galeotes, Colotes,* and *Askalabotes.* It was, as we have seen, the *Geckotte* of Lacep. Its application by Linnæus to his *Lac. calotes* is arbitrary, and was suggested to him by Seba. Spix comprises our Calotes in his genus LOPHYRUS, which is not the same as that of Dumeril.

The most common species, *Lac. calotes*, L.; Seb. I, lxxxix, 2; xciii, 2; xcv, 3 and 4; Daud., III, xliii; *Agama ophiomachus*, Merr., is of a pretty light blue with transverse white streaks on the sides; there are two rows of spines behind the ear. From the East Indies. It is called a Chameleon in the Moluccas, although it does not change its colours. The eggs are fusiform.(1) In the

Lophyrus, Duméril,

The scales on the body are similar to those of the Agamæ; there is also a crest of palisado-like scales still higher than that of the Calotes. The tail is compressed and the femoral pores are wanting. A remarkable species is,

Agama gigantea,(2) Kuhl; Seb. I, c. 2, whose dorsal crest is placed very high on the neck, and is formed of several rows of vertical scales; two bony ridges, one on each side, extend from the muzzle to the eye, where they terminate in a point, and join

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(1) Add the *Ag. gutturosa*, Merr. or *cristatella*, Kuhl; blue, without bands, and small scales on the back; Seb., I, lxxxix, 1;—the *Ag. cristata*, Merr., Seb. I, xciii, 4, and II, lxxvi, 5, a reddish brown, with blackish brown scattered spots, of which the *Agame arlequiné*, Daud. III, xliv, is the young;—the *Ag. vultuosa*, Harl. Phil. Ac. Nat. Sc. IV, xix.* All these species are from the East Indies; the *Lophyrus ochrocollaris* and *margaritaceus*, Spix, XII, 2, are American Calotes; the first is the same as the *Agama picta*, Pr. Max.; the *Loph. panthera*, Spix, pl. xxiii, f. 1, is the young of the same. Add to these American Calotes *Loph. rhombifer*, Spix, xi, of which the *Loph. albomaxillaris*, Id., XXIII, f. 2, is the young;—*Loph. auronitens*, Spix, pl. xiii. We might separate from the other Calotes a species from Cochin China, with a smooth back, without any visible scales; the belly, limbs and tail covered with carinated scales (*Cal. lepidogaster*, Nob.); the *Ag. catenata*, Pr. Max. liv. V, may belong to this group.

N.B. The designer of Seba's plates has given to most of his Iguanæ, Agamæ, Calotes, &c. extensible and forked tongues, drawn from imagination.

(2) It is difficult to imagine the reason that induced Kuhl to call this Saurian gigantic, as it is not larger than its most closely allied Agamæ and Calotes.

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* From the observations of Major Le Conte, it would seem that what is here called the *Ag. vultuosa* is the young of another species. *Am. Ed.*

on the temple. This singular Saurian appears to belong to India. The

Gonocephalus, Kaup.

Is closely allied to Lophyrus; the cranium also forms a sort of disk by means of a ridge which terminates in a notch above each eye. There is a dewlap and a crest on the neck. The tympanum is visible.(1)

Lyriocephalus, Merr.

In addition to the characters of a Lophyrus, the species of this subgenus have a tympanum concealed under the skin and muscles, like that of the Chameleon: they also have a dorsal crest and a carinated tail.

In the species known, *Lyrio margaritaceus*, Merr.; *Lacerta scutata*, L.; Seb. cix, c, the bony crest of the eye-brows is still larger than in the Ag. gigantea, and terminates behind, on each side, in a sharp point. Large scales are scattered among the small ones on the body and limbs; imbricated and carinated scales on the tail; a soft, though scaly enlargement on the end of the muzzle. This truly singular species is found in Bengal and other parts of India.(2) It feeds on grain.

Brachylophus, Cuv.

Small scales; the tail somewhat compressed; a slightly salient crest on the neck and back; a small dewlap, a series of pores on each thigh, and, in a word, a strong resemblance to the Iguanæ; but they have no palatine teeth; those of the jaws are denticulate. Such is

L'Iguane à bandes, Brong., Essai et Mém. des Sav. Etr. I, pl. x, f. 5. From India. It is a deep blue, with light blue bands.

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(1) Isis, 1825, I, p. 590, pl. iii.

(2) From this *Lyriocephalus*, the Pneustes of Merrem and the Phrynocephalus of Kaup, Fitzinger forms a family called Pneustoidea, which he approximates to that of the Chameleons. The *Pneustes* depend altogether on a vague and imperfect description of Azzara, II, 401, on which, also, Daudin had established his *Agame à queue prenante*, III, 440; Azzar. says that its ear is not visible, probably because it is very small. The Phrynocephalus is composed of the *Lac. guttata* and the *Lac. uralensis*, Lepechin. Voy. I, p. 317, pl. xxii, f. 1 and 2, which form but one species. Kaup asserts that it has no external tympanum (Isis of 1825, I, 591). Not having seen these animals, I hesitate as to their classification. Another subgenus will probably have to be made of the *Lézard à oreilles* (*Lac. aurita*, Pall.), Daud., III, xlv, remarkable for the faculty it possesses of inflating the two sides of the head under the ears: I have not, however, been able to examine it.

PHYSIGNATHUS, Cuv.

The same teeth, scales, and pores; the head very much enlarged behind, and without the dewlap; a crest of large pointed scales on the back and tail, which is strongly compressed.

> *Ph. cocincinus*, Nob. is a large species from Cochin China; blue, with stout scales, and some spines on the enlargements of the sides of the head. It lives on fruit, &c.

ISTIURUS, Cuv.—LOPHURA, Gray.(1)

The distinguishing character of this genus consists in an elevated and trenchant crest, which extends along a part of the tail, and which is supported by high spinous apophyses of the vertebræ; this crest is scaly like the rest of the body; the scales on the belly and tail are small, and approach somewhat to a square form; the teeth are strong, compressed, and without denticulations: there are none in the palate: there is a series of femoral pores. The skin of the throat is smooth and lax, but without forming a dewlap.

> *Lac. amboinensis*, Gm.; *Le Porte-Crête*, Lacép.; Schlosser, Monog., cop. Bonnat. Erpet. pl. v, f. 2. The crest confined to the origin of the tail; some spines on the front of the back; lives in water, or on the shrubs about its shores; feeds on seeds and worms. We have discovered in its stomach both leaves and insects. It is sometimes found four feet in length. Its flesh is edible.

DRACO, L.(2)

The Dragons are distinguished at the first glance, from all other Saurians, by their first six false ribs, which, instead of encircling the abdomen, extend outwards in a straight line, and support a production of the skin, forming a kind of wing that may be compared to that of a Bat, but which is not connected with the four feet; it acts like a parachute in supporting them, when they leap from one branch to another, but has not sufficient power to enable them to rise like a Bird. They are small animals, completely invested with little imbricated scales, of which those on the tail and limbs are carinated. Their tongue is fleshy, but slightly extensible, and somewhat emarginate. A long pointed dewlap hangs under their throat, supported by the tail of the os hyoides; there are also two smaller ones on the sides attached to the horns of the same bone. The tail is long; there are no porous granules on the thighs, and there is a little notch on the nape of the neck. Four small incisors are found in each jaw, and on each side a long and pointed canine, and twelve triangular and tribolate grinders.

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(1) I have changed this name of *Lophura*, which is too much like that of *Lophyrus*.

(2) The term δρακων, *draco*, generally designated a large Serpent; *Dragons*, with a crest or beard, are spoken of by ancient writers, a description which can only apply to the *Iguana;* Lucian is the first who mentions *Flying Dragons*, alluding, no doubt, to the pretended Flying Serpents treated of by Herodotus; St Augustine, and other subsequent authors, ever after described Dragons as having wings.

They consequently have the scales and dewlap of the Iguanæ, with the head and teeth of the Stellio.

All the known species are from the East Indies; they were confounded for a great length of time, but Daudin has accurately determined their specific differences.(1)

Sitana, Cuv.(2)

Teeth of the Agamæ and four canini; body and limbs covered with imbricated and carinated scales; no pores on the thighs; but their ribs are not extended outwards. It is distinguished by an enormous dewlap which reaches to the middle of the belly, and which is twice the height of the animal.

Sit. ponticeriana, Cuv. is the only known species, and is from the East Indies. It is small, fawn-coloured, and has a series of broad, brown, rhomboidal spots along the back.

It is perhaps to this tribe of *Agamians* that we should approximate a very extraordinary reptile which is only to be found among the fossils of the old Jura limestone formation.

Pterodactylus, Cuv.(3)

It had a short tail, an extremely long neck, and a very large head; the jaws armed with equal and pointed teeth; but its chief character consisted in the excessive elongation of the second toe of the fore-foot, which was more than double the length of the trunk, and most probably served to support some membrane which enabled the animal to fly, like that upheld by the ribs of the dragon.

The second section of the Iguanian family, that of the Igua-

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(1) The *Dragon rayé*;—the *Drag. vert*, Daud., III, xli;—the *Drag. brun*.

(2) *Sitan* is the name of the species on the Coast of Coromandel.

(3) See my Oss. foss. 2d ed. Vol. V, p. 2, pl. xxiii.

proper, is distinguished from the first by having teeth palate.

IGUANA, Cuv.

uana, properly so called, the body and tail are covered small imbricated scales; along the entire length of the back, is a range of spines, or rather of recurved, compressed, and pointed scales; beneath the throat a pendent, compressed dewlap, the edge of which is supported by a cartilaginous process of the hyoid bone; a series of porous tubercles on their thighs as in the true Lizards; the head covered with plates. Each jaw is surrounded with a row of compressed, triangular teeth, whose cutting edge is denticulate; two small rows of the same on the posterior edge of the palate.

Ig. tuberculata, Laur.; *Lac. Iguana*, L.; Seb. I, xcv, 1, xcvii, 3, xcviii, 1. (The Common American Iguana.)(1) Yellowish green above, marbled with pure green; the tail annulated with brown; preserved in alcohol it appears blue, changing to green and violet, and dotted with black; paler beneath; a crest of large spiniform dorsal scales; a large round plate under the tympanum at the angle of the jaws; sides of the neck furnished with pyramidical scales scattered among the others; anterior edge of the dewlap denticulate like the back; from four to five feet in length: common in South America where its flesh is esteemed delicious, although unwholesome, particularly for syphilitic patients. It lives mostly on trees, occasionally visits the water and feeds on fruit, grain, and leaves; the female lays her eggs in the sand, they are the size of those of a Pigeon, agreeable to the taste and almost without white.

L'Iguane ardoisé, Daud.; Seb. I, xcv, 2, xcvi, 4. (The Slate-coloured Iguana.) A uniform violet blue, paler beneath; the dorsal spines smaller; otherwise, similar to the preceding, both of them having an oblique whitish line on the shoulder. The latter is from the same country as the former, and is probably a mere variety of age or sex.(2)

Ig. nudicollis, Cuv.; Mus. Besler. tab. XIII, f. 3; *Ig. delicatissima*, Laur., resembles the common one, particularly in its dorsal crest, but has no infra-tympanal plate, nor the scattered tubercles on the sides of the neck. The top of the cranium is furnished with arched plates; the occiput is tuberculous; the dewlap is moderate, and has but few indentations, and those only before. *Laurenti* says its habitat is India, but he is mistaken; we have received it from the Brazils, and from Guadaloupe.(1)

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(1) The Mexicans call it *Aquaquetzpallia*, Hernand.; the Brazilians, *Senembi*, Marcgr.

(2) I have every reason to think that this same conclusion should be extended to the Iguanas of Spix, pl. v, vi, vii, viii, and ix: they seem to me to be nothing more than various ages of the common species.

Ig. cornuta, Cuv.; *Ig. cornu de St Domingue*, Lacep.; Bonnat. Encyc. Method. Erpetolog. Lézards, pl. iv, f. 4. (The Horned Iguana.) Similar to the *Common Iguana*, and still more so to the preceding species, but is distinguished by a conical, osseous point between the eyes, and by two scales raised up over the nostrils; the infra-tympanal plate is deficient as well as the tubercles on the neck, but the scales on the jaws are embossed.

Ig. cychlura, Cuv. (The Carolina Iguana.) No infra-tympanal plate or small spines on the neck, but carinated scales, rather larger than the rest, form cinctures on the tail at separate intervals.(2)

OPHRYESSA, Boié.

Small imbricated scales; a slightly salient dorsal crest, extending on the tail, which is compressed; denticulated maxillary teeth, and teeth in the palate: circumstances which approximate them to Iguana; but they have no dewlap, nor femoral pores.

Lac. superciliosa, L.; Seb. I, cix, 4; *Lophyrus xiphurus*, Spix, X, so called from a membranous carina which forms its eyebrow, is an American species, of a fawn colour, with a festooned brown band along each flank.

BASILISCUS, Daud.

No pores; palatine teeth; the body covered with small scales; on the back and tail a continuous and elevated crest supported by the spinous apophyses of the vertebræ, like that on the tail of the Istiuri.

The species known, *Lacerta basiliscus*, L., Seb. I, c. 1; Daud. III, xlii, is recognized by the hood-like membranous prominence of its occiput, that is supported by cartilage. It attains a large size, is bluish, with two white bands, one behind the eye, the other back of the jaws, which are lost on the shoulder.(1) It is from Guiana, and feeds on grain.

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(1) I suspect the *Amblyrhynchus cristatus*, Bell. Zool. Journ. 1, Supp. p. xii, is a badly prepared specimen of my *nudicollis*.

(2) It also appears to me that this *Iguana* is the same which Dr Harlan (Journ. Acad. Nat. Sc. of Phil. IV, pl. xv,) calls *Cyclura carinata*; but in this case there must be some mistake, as in the Amblyrhynchus, relative to the palatine teeth. These teeth exist in all my Iguanas.

POLYCHRUS, Cuv.

Teeth in the palate as in Iguana, and femoral pores, though the latter are not strongly marked; but the body is covered with small scales, and is destitute of a crest. The head is covered with plates; tail long and slender; throat very extensible, so that a dewlap is formed at the will of the animal, which, like the Chameleon, possesses the faculty of changing colour; the lungs, consequently, are very voluminous, occupy nearly the whole trunk, and are divided into several branches; the false ribs, like those of the chameleon, surround the abdomen by uniting so as to form perfect circles.

Lac. marmorata, L.; *Marbré de la Guiane*, Lacép. I, xxvi; Seb. II, lxxvi, 4; Spix, XIV. Reddish-grey, marbled with irregular transverse bands of a brown-red, sometimes mixed with blue; the tail very long. Common in Guiana.(2)

ECPHIMOTUS, Fitzinger.

Teeth and pores of a Polychrus, but small scales on the body only; on the tail, which is very thick, they are large, pointed, and carinate; the head is covered with plates. Their form is somewhat short, and flattened, more like that of certain Agamæ than of a Polychrus.

The most common species, *Agama tuberculata*, Spix, XV, 1, or *Tropidurus torquatus*, Pr. Max.(3) is ash-coloured, sprinkled with whitish drops, and has a black semi-collar on each side of the neck. It inhabits Brazil.

OPLURUS, Cuv.(4)

Teeth of a Polychrus and the form of an Agama, but no pores on the thighs, and the pointed and carinated scales of the tail ally it to that of a Stellio; the dorsal scales also are pointed and carinate, but very small. One species only is known.

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(1) It is on the authority of Seba that this species has hitherto been considered as inhabiting India—it does not inhabit that country.

(2) Add, *Pol. acutirostres*, Spix, XIV.

(3) The *Tropidurus* of Pr. Max. de Wied. is not, as he imagined, the *Quetzpaleo* of Seba, although it is also marked with black semi-collars.

(4) The name of *Quetzpalco*, given by Seba to the above species, seems to be a corruption of the Mexican *Aqua quetz pallia*, which appears to be a name of the Iguana; the Quetzpaleo of Lacep., Rept. 4to, II, 497, is a Uromastix; but the figure quoted is that of Seba's animal.

Opl. torquatus, Cuv. (The Black-collared Grey Quetzpaleo.) A black half collar on each side of the neck. From Brazil.

ANOLIUS, CUV.(1)

In addition to all the peculiarities of form of the Iguana, and particularly of the Polychrus, these animals have a very peculiar and distinctive character: the skin of their toes is spread out under the antepenultimate phalanx into an oval disk transversely striated beneath, which assists them to attach themselves to various surfaces, to which, independently of this, they cling with great pertinacity by means of their nails, which are very much hooked. Their body and tail, moreover, are uniformly roughened with small scales, and most of them have a dewlap under the throat, which under the excitement of passion becomes inflated and changes colour. Several enjoy the faculty of changing the colour of their skin, to an equal degree with the Chameleon. Their ribs form entire circles like those of the *Polychrus* and *Cameleon*. Their teeth are trenchant and denticulate, as in Polychrus and Iguana, and they are even found in the palate. The skin of their tail is doubled into slight folds or depressions, each of which contains some circular rows of scales. This genus appears to be peculiar to America.

The tail of some is ornamented with a crest supported by the spinous apophyses of the vertebræ, as in Istiurus and Basiliscus.(2)

An. velifer, Nob. (The Great Crested Anolis.) A foot long; a crest on the tail occupying half its length, supported by from twelve to fifteen rays; the dewlap extends under the belly. Its colour is a blackish ash-blue. From Jamaica and the other Antilles. We have found berries in its stomach.

Lac. bimaculata, Sparm. (The Little Crested Anolis.) Half the size of the preceding; the same crest; greenish, dotted with brown about the muzzle and on the flanks. From North America and several of the Antilles.

An. equestris, Merr. Fawn-colour, shaded with an ashy lilac;

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(1) *Anoli*, *Anoalli*, the name of these Saurians in the Antilles; *Gronovius*, very gratuitously, has applied it to the *Ameiva*. *Rochefort*, from whose work it was taken, only gives a copy of the *Tryuguaçu* of Marcgrave, or the Great Sauvegarde of Guiana. *Nicholson* seems to assert that this name is applied to several species, and the one he describes appears to be the *An. roquet*, which, in fact, was sent to the Museum from Martinique under the name of *Anolis*. MM. de Tonnes has even ascertained that it is the only one by which it is now known.

(2 They have been confounded with each other, and with some of the following ones, under the names of *Lac. principalis* and *bimaculata*.

a white band on the shoulder; tail so fleshy that the apophyses of its crest cannot be perceived; a foot long.

Others again have a round tail, or one that is merely a little compressed.

Their species are numerous, and have been partly confounded under the names of *Roquet*, *Goitreux*, *Rouge-gorge*, and *Anolis*, —*Lac. strumosa* and *bullaris*, L. They inhabit the hot parts of America and the Antilles, and change colour with astonishing facility, particularly in hot weather. When angry, their dewlap becomes inflated and as red as a cherry. These animals are not so large as the Grey Lizard of Europe, and feed on insects which they actively pursue; it is said that whenever two of them meet, a furious combat inevitably ensues.

The species of the Antilles, or the *Roquet* of Lacep. I, pl. xxvii, which is more particularly the *Lac. bullaris*, Gm., has a short muzzle speckled with brown, and salient eye-lids; its usual colour is greenish. Its round tail excepted, it closely resembles the *Lac. bimaculata.* The *Anolis rayé*, Daud. IV, xlviii, 1, only differs from it in a series of black lines on the flank. It seems to be identical with the *Lac. strumosa*, L. Seb. II, xx, 4, and is somewhat longer than the preceding species.

The *Carolina Anolis*, *Iguane goitreux*, Brongn. Catesb. I, lxvi, is of a fine golden green; a black band on the temple and a long and flattened muzzle give it a peculiar physiognomy and render it a very distinct species.(1)

It is to this family of the Iguanæ with palatine teeth, that belongs an enormous fossil reptile known by the name of the *Maestricht Animal*, and for which the new name of MOSASAURUS has recently been coined.(2)

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(1) Add the *Anolis à points blancs*, Daud. IV, xlviii, 2;—*An. viridis*, Pr. Max. lib. VI;—*An. gracilis*, Id. and several other species, of which, unfortunately, I have no figures to cite.

(2) See Oss. foss. Vol. V, part. II.

Many large reptiles have been discovered in a fossil state, which it appears should be approximated to this family, but their characters are not sufficiently known to enable us to class them with precision. Such are the GEOSAURUS discovered by Sœmmering, the MEGALOSAURUS of M. Buckland, the IGUANODON of M. Mantell, &c. See Oss. Foss. ut sup.

FAMILY IV.

GECKOTIDA.

This family is composed of nocturnal lizards which are so similar that they may be left in one genus.

GECKO, Daud.—ASKALAROTES, Cuv.—STELLIO, Schn.(1)

The Geckos are Saurians which do not possess the elongated graceful form of those of which we have hitherto spoken, but on the contrary are flattened, the head particularly. Their feet are moderate, and the toes almost equal; their gait is a heavy kind of crawling; very large eyes, whose pupil becomes narrowed at the approach of light, like that of a cat, render them nocturnal animals, which secrete themselves during the day in dark places. Their very short eye-lids are completely withdrawn between the eye and the orbit, which gives them a different aspect from other Saurians. Their tongue is fleshy and non-extensible; their tympanum somewhat sunk; their jaws every where furnished with a range of very small closely-joined teeth; their palate without teeth; their skin is studded above with very small granular scales, among which are often found larger tubercles, and beneath, covered with scales somewhat smaller, which are flat and imbricated. Some species have the femoral pores. There are circular plaits on the tail as on that of an Anolis, but when broken, it grows without these folds, and even (where there are any naturally) without tubercles; circumstances which have led to an undue multiplication of species.

This genus is numerous and disseminated throughout the warm portions of both continents. The melancholy and heavy air of the Gecko superadded to a certain resemblance it bears to the Salamander and the Toad, have rendered it the object of hatred, and caused it to be considered as venomous, but of this there is no real proof.

The toes of most of them are widened along the whole or part of their length, and furnished beneath with regular plaits of skin, which enable them to adhere so closely, that they are sometimes seen crawling along ceilings. Their nails are variously retractile, and preserve their point and edge, which, conjointly with their eyes, authorize us to say, that the Gecko, as compared to other Saurians, is what the Cats are to the Carnivorous Mammalia; but these nails vary according to the species, and in some are entirely wanting.

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(1) *Gecko*, a name given to a species in India, in imitation of its cry, just as another one is termed *Tockaic* at Siam, and a third *Geitje* at the Cape; ασκαλαϐωτης, the Greek name of the Geckotte, Lacep.

In the first and most numerous division of the Geckos, which I will call the

PLATYDACTYLI,

The toes are widened throughout, and covered beneath with transverse scales.

Some have no vestige of a nail, and their thumbs are very small. They are beautiful species, completely covered with tubercles, and painted with the most lively colours. Those known are from the Isle of France.

In others, the femoral pores are deficient.(1)

One of them, *G. inunguis*, Cuv. is violet above, white beneath, with a black line on the flank. Another, *G. ocellatus*, Oppel. is grey, completely covered with ocellated brown spots with a white centre.

In some again these pores are very strongly marked.(2) Such is the *Gecho cepedien*, Peron, of the Isle of France; pale yellow, marbled with blue; a white line along each flank.

I am not sure, however, that the pores in this first subgenus are not sexual indications.

Other Platydactyli have no nail to their thumb, nor to the second and fifth toes of all the feet; the femoral pores are also deficient.(3) Such is,

Gecko fascicularis, Daud. *Lacert. facetanus*, Aldrov. 654, *Tarente* of Provence; *Tarentola*, or rather *Terrentola* of the Italians; *Stellio* of the ancient Latins; *Geckotte*, Lacep. A dark grey; rough head; the whole upper surface of the body studded with tubercles, each of which consists of three or four smaller ones; the scales on the under part of the tail similar to those on the belly. It is a hideous animal, which hides in holes of walls, heaps of stones, &c., covering its body with dust and filth. The same species appears to exist every where about the Mediterranean, and in Provence and Languedoc.

There is a neighbouring species in Egypt and in Barbary, with simple round tubercles, which are more salient on the flanks,—*G. ægyptiacus*, Nob. Egypt., Rept., pl. v, f. 7.(1)

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(1) M. Gray appropriates the name of Platydactylus to this division.

(2) It is from this division that M. Gray has made his genus *Phelsuma*; the *Lacerta gietje* of Sparm. should belong to it. They are considered very venomous at the Cape.

(3) This division forms the genus TARENTOLA of Gray.

The nails are only deficient in the four thumbs of the greater number of the platydactile Geckos. They have a range of pores before the anus.(2) Such are,

Gecko, Lacep. I, xxix; *Stellio Gecko*, Schneid.; *Le Gecko à gouttelettes*, Daud.; Seb. I, cviii, the whole plate. Rounded, slightly salient tubercles over the upper surface of the body, whose red ground is sprinkled with round white spots; tail furnished beneath with square and imbricated scales. Seba says it is from Ceylon, and pretends that it is to this identical species that the name of *Gecko* is applied in imitation of its cry; but long before him it was attributed by Bontius to a species of Java. It is probable that the cry and the name are common to several species. We have ascertained that this one is found throughout the Archipelago of India.

Lac. vittata, Gm.; *Le Gecko à bandes; Lizard Pandang*, at Amboina; Daud. IV, l. Brown; a white band on the back which bifurcates on the head and on the root of the tail; tail annulated with white. From the East Indies: found at Amboina on the branches of the shrub called the Pandang.(3)

There are some of these four-nailed Platydactyli whose body is edged with a horizontal membrane, and which have palmated feet. One of the most remarkable is

Lac. homalocephala, Crevett., Soc. of Nat. of Berlin, 1809, pl. viii, the sides of whose head and body are augmented by a broad membrane, which is scalloped into festoons on the sides of the tail. Its feet are palmated. Found in Java, in Bengal.(4)

There is another species in India with a bordered head and body, and palmated feet, but in which the festoons on the tail, and the pores near the anus, are deficient,—PTEROPLEURA *Horsfieldii*, Gray, Zool. Jour. No. X, p. 222.

Finally, some Platydactyli have no nails to all their toes.

There is a smooth species with palmated feet in France,—*A. Leachianus*, Nob.

In a second subdivision of the Geckos, which I call the

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(1) This fig. entitled *Var. du Gecko annulaire*, has too many nails.

(2) This division is the *Gecko* proper of M. Gray.

(3) N.B. Daudin erroneously gives nails to the thumbs of these two Geckos.

(4) This bordered Platydactylus forms the genus *Ptychozoon* of Fitzinger. M. Gray also separates his PTEROPLEURA from them on account of the absence of the pores.

HEMIDACTYLI,

The base of the toes is furnished with an oval disk formed beneath by a double row of scales, en chevron; from the middle of this disk rises the second phalanx, which is slender, and has the third or the nail at its extremity. The species known have five nails, and a series of pores on each side of the anus. The sub-caudal scales form broad bands like those on the belly of Serpents.

There is one species in the south of Europe, *G. verruculatus*, Nob., of a reddish grey; the back covered with little conical tubercles, somewhat rounded; circles of similar tubercles round the tail; found in Italy, Sicily and Provence like the *G. fascicularis.*

A very similar species, *G. mabuia*, Nob., with still smaller tubercles, those of the tail more pointed; grey, clouded with brown; brown rings on the tail, abounds throughout the hot portions of America, where it enters the houses. It is known in the French colonies by the name of *Mabouia des murailles.*(1)

There are others at Pondicherry and Bengal so very similar that we are almost induced to believe that they have been carried there in vessels.(2)

A Hemidactylus with a bordered body, *G. marginatus*, Nob. is also found in India; its feet are not palmated; the tail is horizontally flattened, and its edges are trenchant and somewhat ciliated. It was sent from Bengal by M. Duvaucel.

In the third division of the Gecko's, which I will call

THECADACTYLI,

The toes are widened throughout, and furnished beneath with transverse scales; but these scales are divided by a deep longitudinal furrow, in which the nail can be completely concealed.

In those species which are known to me the nails are deficient on the thumbs only; the femoral pores are wanting, and their tail is covered above and beneath with small scales.

G. lævis, D.; *Stellio perfoliatus*, Schn.; *Lac. rapicauda*, Gm.; *Le Gecko lisse*, Daud. IV, li. Known in the French colonies as the *Mabouia des bananiers.* Grey, marbled with brown; finely granulated, but without tubercles above; small scales beneath; its naturally long tail, which is encircled with plaits as usual, is easily broken, and the new one that succeeds is sometimes considerably enlarged, resembling a small radish. It is from these accidental monstrosities that it has received the name of *G. rapicauda.* (1)

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(1) So far as we can judge from the figure, the *Thecadactylus policaris* and the *Gecko aculeatus*, Spix, XVIII, 2 and 3, seem to be different ages of this *Mabouia des murailles.* MM. de Jonnès has given a monograph of them, but he confounds it with different species.

(2) To this division, also belong the *G. à tubercules triédres* and the *G. à queue épineuse* of Daud.; the first is identical with the *Stell. mauritanious* of Schn. The *Stell. platyurus*, Schn. is also closely allied to it.

In the fourth division of the Geckos, or

PTYODACTYLI,(2)

The ends of the toes only are dilated into plates, the under surface of which is striated so as to resemble a fan. The middle of the plate is split and the nail placed in the fissure. Each toe has a strongly hooked nail.

The toes of some are free, and their tail round.

Lac. gecko, Hasselq.; *Gecko lobatus*, Geoff. Rept. Egyp. III, 5; *Stellio Hasselquistii*, Schn. Smooth; reddish-grey dotted with brown; the scales and tubercles very small; common in houses on the south and east of the Mediterranean. At Cairo it is called the *Abou burs* (father of leprosy), on account of its communicating that disease by poisoning (as they say) the salted provisions and other aliments with its feet, in crawling over them. In passing over the skin it occasions a redness, but this is perhaps solely owing to the fineness of its nails. Its cry somewhat resembles that of a Frog.

In others, each side of the tail is edged with a membrane, and the feet are semi-palmate; they are probably aquatic, and are the UROPLATES of Duméril.

Stellio fimbriatus, Schn.; *Le Gecko frangé; Tête plate*, Lac., or *Famo-Cantrata* of Madagascar, Brug.; Lacep. I, xxx; Daud. IV, lii. The membrane on the sides of the tail extending along the flanks where it is slashed and fringed. Found in Madagascar upon trees, where it leaps from branch to branch. The natives, though without any reason, hold it in great fear.(3)

Lac. caudiverbera, L.; *Gecko du Pérou*, Feuillée, I, 319. No fringe on the sides of the body, it being confined to those of the tail on which there is also a vertical membranous crest. Feuillée found it in a spring in the Cordilleras. It is blackish and more than a foot long.

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(1) The *G. squalidus*, Herm. if not the same as the *lævis*, belongs to this division. The *Gecko de Surinam*, Daud. is only a younger and better coloured specimen of the *lævis*.

(2) From πτυον, fan.

(3) According to Brugiére's description, the *Sarroubé* of Madagascar has all the characters of the *Famo-cantrata*, except the fringe and a deficiency of the thumb in the fore feet. M. Fitzinger has taken it for his genus SARRUBA.

We may make a fifth division, the

SPHERIODACTYLI,

Of certain small Geckos, the ends of whose toes terminate in a little pellet without folds, but always with retractile nails.

When this pellet is double or emarginated in front, they are closely allied to the simple Ptyodactyli. The species known are from the Cape or from India: such is the

G. porphyré, Daud. Reddish-grey, marbled and dotted with brown.(1)

Most generally the pellet is simple and round. The species are all American: such is the

G. sputateur à bandes, Lacep., Rept. I, pl. xxviii, f. 1. A small species, prettily marked with transverse brown bands laid on a red ground: common in the houses of St Domingo where it is also called the Mabouia. There is a neighbouring species in the same island, but which is of a uniform ash-colour, Id., Ib. f. 2.

Finally, there are some Saurians which, possessing all the characters of Geckos, have no enlargement of the toes. Their five nails however are retractile.

Some of them have a round tail, and the toes striate beneath and indented along the sides, constituting the

STENODACTYLI.

There is one in Egypt, *Sten. guttatus*, Egyp., Rept. pl. V, f. 2.(2) Smooth, grey, sprinkled with whitish spots.

Others have naked and slender toes: those which have a round tail form the

GYMNODACTYLI, Spix.

Some of these are found in America with regular suites of small tubercles. The *Gymnodactylus geckoides*, Spix, X, viii, 1, also appears to be one of them.

Others again have their tail flattened horizontally, so as to resemble the shape of a leaf.

PHYLLURUS.

Only one species is known, and that is from New Holland,

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(1) Daudin was mistaken in considering this Gecko as an American species, and synonymous with the *mabouia*.

(2) Under the improper name of *Agame ponctué*. It is reproduced in the Supp. pl. 1, f. 2; and a neighbouring species, f. 4.

Stellio phyllurus, Schn.; *Lacerta platura*, White, New South Wa., p. 246, f. 2.(1) Grey marbled with brown above; completely covered with small pointed tubercles.

We are compelled to establish

FAMILY V,

CHAMÆLEONIDA,

For the single genus,

CHAMÆLEO,(2)

Or the Chameleons, which is very distinct from all other saurian genera, and is not even easily intercalated in their series.

Their skin is roughened by scaly granules, their body compressed, and the back—if we may so express it—trenchant; tail round and prehensile; five toes to each foot, but divided into two bundles, one containing two, the other three, each bundle being united by the skin down to the nails; the tongue fleshy, cylindrical, and susceptible of great extension; teeth trilobate; eyes large, but nearly covered by the skin, except a small hole opposite to the pupil, and possessing the faculty of moving independently of each other; no visible external ear, and the occiput pyramidically elevated. Their first ribs are joined to the sternum; the following ones are extended each to its fellow on the opposite side, so as to enclose the abdomen by an entire circle. Their lungs are so enormous, that when inflated, their body seems to be transparent, a circumstance which induced the ancients to believe that they fed on air. They live on insects which they capture with the viscid extremity of their tongue, the only part of their body which seems to be endowed with quickness of motion, as in every thing else they are remarkable for their excessive slowness. The great extent of their lungs is probably the cause of their faculty of changing colour, which takes place, not as is thought in conformity with the hue of the bodies on which they rest, but according to their wants and passions. Their lungs, in fact, render them more or less transparent, compel the blood in a greater or less degree to return to the skin, and even colour that fluid more or less vividly in proportion to the quantity of air they contain. They always remain on trees.

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(1) Referred by Daudin to *Stellio;* why, it is difficult to say.

(2) Χαμαιλεων (Little Lion), the Grecian name of this animal. Aristotle, who uses it, has also given an excellent description of it. Hist. An. Lib. II, cap. xi.

Lac. africana, Gm.; *Caméléon ordinaire*, Lacep., I, xxii; Seb. I, lxxxii, 1, lxxxiii, 4.(1) (The Common Chameleon.) The hood pointed and relieved by a ridge in front; the granules on the skin equal and close; the superior crest indented as far as half the length of the back, the inferior to the anus. The hood of the female does not project so much and the denticulations of her crests are smaller. From Egypt, Barbary, and even the south of Spain, and India.

Cham. tigris, Cuv. Another similar species from the Sechelles with a hood resembling that on the female of the preceding; the granules on the skin fine and equal; it is distinguished by a denticulated and compressed appendage under the extremity of its lower jaw. The body is sprinkled with black points.

Cham. verrucosus, Cuv. A third neighbouring species from the island of Bourbon, marked by granules larger than the others which are scattered among them, and by a series of warts, parallel to the back at about two thirds of its height. The hood is like that on the female of the common one; the notches on the back are deeper, those on the belly the reverse.

Cham. pumilus, Daud. IV, liii; *Lacerta pumila*, Gm.; *Cham. margaritaceus*, Merr; Seb. lxxxii, 4, 5. The hood directed backwards; warts scattered on the flanks, limbs and tail; numerous, compressed, finely notched appendages (lambeaux) under the throat, which vary in each individual. Found at the Cape, Isle of France and the Sechelles.(2)

Ch. planiceps, Merr., Seb. I, lxxxiii, 2; *Lacerta chamælion*, Gm. The hood flattened, and almost destitute of a ridge; its figure is a horizontal parabola. Found in Senegal, Barbary, and even in Georgia.

Ch. pardalis, Cuv. The hood flat like that of the Senegal species; but there is a little prominent edge to its muzzle, in front of the mouth; larger granules scattered among the smaller ones, and the body irregularly marked with round black spots, edged with white. From the isle of France.

Ch. Parsonii, Cuv. Phil. Trans. LVIII. Another species, with a flat hood, which is slightly truncated behind; crest of the eye-brow prolonged and turned up, on each side of the end of the muzzle, into an almost vertical lobe. The granules are equal, and there is no emargination either above or beneath.(1) Finally, the

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(1) The *Cam. trapu*, Egyp. Rept. IV, 3; *Ch. carinatus*, Merr., *Ch. subcroceus*, Id.?

(2) I believe the *Cham. seichellensis* of Kuhl to be a female of the *pumilus*.

Ch. bifurcus, Brongn.; *Caméleon des Moluques à nez fourchu;* Daud. IV, liv, has a semicircular flat hood; two large compressed, salient prominences in front of the muzzle, which varies in length; probably a sexual difference. The granules are equal, the body is sprinkled with closely set blue spots, and at the bottom of each flank is a double series of white ones.

FAMILY VI.

SCINCOIDEA.

Known by their short feet, non-extensible tongue, and the equal scales which cover the body and tail, like tiles.

SCINCUS, Daud.

Four short feet; the body and tail almost one continued and uniform piece; no enlargement of the occiput; without crest or dewlap, and covered with uniform, shining scales, arranged like tiles, or those of a Carp. Some of them are fusiform; others, more or less elongated, resemble Serpents, the *Anguis* particularly, to which they are related by several internal affinities, and which they connect with the family of the Iguanida, by an uninterrupted suite of transitions. Their tongue is fleshy, but slightly extensible and emarginate; the jaws every where furnished with small, closely set teeth. In the anus, eye, ear, &c., they bear a greater or less resemblance to the Iguanæ and Lizards; the feet are furnished with free and unguiculated toes.

Certain species have palatine teeth, and an emargination on the anterior edge of the tympanum.

Among this number, on account of its trenchant and somewhat raised muzzle,(2) we should distinguish the

Scinc. officinalis, Schn.; *Lac. scincus*, Lin.; *El Adda* of the Arabs; *Le scinque des pharmacies*, Lacep. I, xxiii; Bruce, Abyss. pl. 39; Egypt. Rep. Suppl. pl. 2, f. 8. Six or eight inches long; the tail shorter than the body; the latter of a silvery yellow; transverse blackish bands; inhabits Nubia, Abyssinia, and Arabia, whence it is sent to Alexandria, and from there distributed throughout Europe. It possesses a surprising facility of burying itself in the sand when pursued.(1)

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(1) I do not know the *Cham. dilepis*, Leach, or *bilobus*, Kuhl.

(2) This species alone composes the genus SCINCUS of Fitzinger, the others constitute his genus MABOUIA.

Among those which have blunt muzzles we may observe a species diffused throughout India; the *Sc. rufescens*, which is greenish, with a yellowish line along the flanks; each scale has three small ridges.

There is one from the south of Africa, very common in the vicinity of the Cape; the *Sc. trivittatus*, brown; three paler lines along the back and tail; black spots between the lines.(2)

But above all we should remark the great Levant species, *Sc. cyprius*, Cuv.; *Lac. cyprius sincoides*, Aldrov., Quadr., Dig. 666; Geoff. Eg. Rept. pl. iii, f. 3, under the name of *Anolis gigantesque*, which is greenish, with smooth scales; the tail longer than the body, and a pale line along each flank.

In others, the Tiliqua of Gray, the palatine teeth are wanting.

There is one of these very common in the south of Europe, Sardinia, Sicily, and Egypt; *Sc. variegatas*, *Sc. ocellatus*, Schn.; Daud., IV, lvi; Geoff. Eg. Rept. pl. v, f. 1, under the name of *Anolis marbré;* and better, Savigny, Ib., Supp. pl. ii, f. 7, which has small, round black spots, each marked with a white streak on the back, flanks, and tail. There is most commonly a pale line along each side of the back.

The French Antilles produce several species, one of which is improperly called there the *Anolis de terre*, and *Mabouia;* Lacep. pl. xxiv; it is smooth; of a greenish brown, and has blackish points scattered along the back; a brown band imperfectly terminated, reaching from the temple over the shoulder, and beyond it.(1)

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(1) The Greeks and Latins called the *Terrestrial Crocodile*, Scincus; it was consequently a Monitor to which they attributed so many virtues; but since the middle century, the above species is usually sold under this name, and for the same purposes. Eastern nations, in particular, consider it as a powerful aphrodisiac.

(2) Add *Sc. erythrocephalus*, Gilliams, Ac. Nat. Sc. Phil. I, xviii [or the *Scorpion Lizard*, Penn. *Am. Ed.*];—*Sc. bicolor*, Harlan, Ib. IV, xviii, 1;—*Sc. multiseriatus*, Nob.; Geoff. Eg. Rep. IV, f. 4, under the name of *Anolis pavé*.—We also think it proper to refer to this subdivision, although we have not been able to procure the animal, the great Scincus, called in Jamaica the *Galley-Wasp;* Sloane, II, pl. 273, f. 9 (*Lac. occidua*, Sh.).

[N.B. A new species of Scincus has lately been described by Messrs Peale and Green, Journ. Acad. Nat. Sc. Philad. Vol. VI, f. 233, under the specific appellation of *ventralis*. It is about fifteen inches in length, and is thus designated, "*Scincus ventralis*.—Cauda longa: corpore supra olivacea, cum maculis nigris, subtus albeo: squamis dorsalibus carinatis et imbricatis; plica maculata in utroque latere corporis: palmis et plantes pentadactylis."

Though the describers of this species prefer considering it a *Scincus*, they think it might very properly constitute a new genus under the name of Pterogasterus. It inhabits Mexico, and is called *Escorpion* by the natives of that country, who consider it extremely venomous. *Am. Ed.*]

The Moluccas and New Holland produce some species of this division, which are remarkable for their thickness.(2)

SEPS, Daud.(3)

Seps only differs from Scincus in the more elongated body, which is exactly similar to that of an Anguis, and in the still smaller feet, the two pairs of which are further apart. Their lungs begin to exhibit some inequality.

There is one species, *S. scincoides*, Nob., with five toes, of which the posterior are unequal.

One with five nearly equal and short toes, *Anguis quadrupes*, L.; *Lacerta serpens*, Gm.; Block, Soc. of Nat. of Berl. vol. II, pl. 2.(4) From the East Indies.

One with four toes, the posterior of which are unequal; (*Tetradactylus decresiensis*, Per.;(5) and one with three, very similar otherwise to the preceding, the *Tridactylus decresiensis*, Per. Both are from the island of Cres, and are viviparous.

A fifth, with three short toes, and very small feet, called in Italy

Cecella or *Cicigna*,—*Lac. chalcides*, L., is grey, with four longitudinal brown stripes, two each side of the back. It is viviparous also, and moves with rapidity without the aid of its feet; lives in meadows, and feeds on spiders, snails, &c.(1)

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(1) The fig. of Lacep. is exact, the tail excepted, which is too short, it having been broken in the original, an accident which frequently occurs to all Lizards.—Add the *Sc. à flancs noirs*, Quoy and Gaym. Voy. de Freyc. pl. 42;—*Sc. bistriatus*, Spix, XXVI, 1.

(2) *Lac. scincoides*, White, 242;—*Sc. nigroluteus*, Quoy et Gaym. Freyc., 41;—*Sc. crotaphomelas*, Per. and Lacep. &c. N.B. I have given but few species of Scincus, because they are so badly characterized by authors, that it is almost impossible to indicate their synonymes with any certainty. There is no genus which stands more in need of a monograph than this.

(3) *Seps* and *Chalcis* were the ancient names of an animal which some consider as a Lizard, and others a Serpent. It is very probable that they designated the three-toed Seps of Greece and Italy. Seps is derived from σηπειν, to corrupt.

(4) It forms the genus LYGOSOMA of Gray; Fitzinger leaves it among his MABUIA, or Scinci without palatine teeth.

(5) It is to this species that Fitzinger appropriates the generic name of SEPS—he calls it *Seps Peronii*.

The southern provinces of France produce a sixth very similar to the preceding, but with eight or nine brown stripes placed at equal distances apart,—*Zygnis striata*, Fitz.

We might separate from the rest a species whose carinated and pointed scales are nearly verticillate;(2) *Lac. anguina*, L. *Lac. monodactyla*, Lacep., Ann. Mus. II, lix, 2, and Vosmaer, Monog. 1774, f. 1, under the name of *Serpent-Lizard.* Its feet are merely small undivided spurs.—Inhabits the environs of the Cape of Good Hope.

Bipes, Lacep.

A small genus, only differing from Seps in the entire absence of fore feet, having the scapulæ and clavicles concealed beneath the skin, the hind feet alone being visible. There is but a step from it to *Anguis.*

Some of them have a series of pores before the anus.(3)

I dissected one of them brought from New-Holland by the late M. Péron, the *Bipède lépidopode*, Lacep., An. du Mus. tom. IV, pl. lv, which has carinated scales on the back, and a tail twice the length of the body.(4) Of its feet, nothing is externally visible but two small oblong and scaly plates; but by dissection we find a femur, a tibia, a fibula, and four metatarsal bones forming toes, but without phalanges. One of its lungs is half the size of the other. It lives in the mud.

This series of pores is wanting in others.

A small species, described a long time ago, is found at the Cape, *Anguis bipes*, L.; *Lacerta bipes*, Gm.; Seb. I, lxxxvi, 3, each of whose feet is terminated by two unequal toes.(5)

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(1) Merrem, on the contrary, had made his genus Seps from this single species. Fitzinger now calls it Zygnis, in imitation of Oken, and adds to it the *Tridactylus decresiensis* of Per. which is much more nearly allied to the *Tetradactylus* of the same island.

(2) It is the genus Monodactylus, Merr., or Chamæsaura, Fitz.

(3) They form the genus Pygopus, Merr.

(4) The fig. of Lacép. is drawn from an individual the tail of which had been broken off and reproduced; we are very liable, generally speaking, to be mistaken in the proportionate length of the tail in all this class.

(5) It is the genus Bipes, Merr. or Scelotes, Fitz. The *Seps gronovien*, or *monodactyle* of Daudin, of which Merrem has made his genus Pygodactylus, was merely a badly preserved specimen of the same, so that this genus must be stricken out as Merrem anticipated. The *Seps sexlineata*, Harl. &c. Nat. Sc. Phil. IV, pl. xviii, f. 2, is a mere variety of it.

Brazil produces another, *Pygopus cariococca*, Spix, xxviii, 2, larger, with undivided feet like those of the *lepidopode*, Lacep., but more pointed, and with entirely smooth scales. It is greenish, with four longitudinal blackish lines.(1)

CHALCIDES, Daud.

Elongated Lizards resembling Serpents; but the scales, instead of being arranged like tiles, are rectangular, forming transverse bands, which do not encroach on each other like those on the tails of ordinary lizards.

Some of them have a furrow on each side of the trunk, and a still apparent tympanum. They are allied to Cordylus just as Seps is connected with Scincus, and lead in many points to Pseudopus and Ophisaurus.

A five-toed species is known, *Lac. seps*, L. which inhabits the East Indies.

Another with four toes, *Lac. tetradactyla*, Lacep. Ann. du Mus. II, lix, 2.(2)

In others the tympanum is concealed, leading directly to Chirotes, and thence to the Amphisbænæ.

There is one species with five toes.(3)

A second in Brazil with four anterior and five posterior, the *Heterodactylus imbricatus*, Spix, xxvii, 1.

A third with four to each foot.(4)

A fifth, whose toes, to the number of five before and three behind, are reduced to such small tubercles, that it has at one time been considered as having three, and at another but one.(5) From Guiana.

CHIROTES, Cuv.

Similar to Chalcides in their verticillate scales, and still more so to the Amphisbænæ in the obtuse form of their head; but distinguished from the former by the absence of hind feet, and from the

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(1) The *Pyg. striatus*, Spix, XXVIII, 1, appears to me to be the young of the same species.

(2) It is the genus TETRADACTYLUS of Merr. or SAUROPHIS of Fitzinger.

(3) This species forms the genus CHALCIDES of Fitzinger.

(4) The genus BRACHYPUS, Fitz.

(5) In the first case it is the *Chalcide*, Lacep. pl. xxxii, the *Chamæsaura cophias*, Schn., the genus CHALCIS, Merr. and the genus COPHIAS, Fitz.; in the second it is the *Chalcide monodactyle*, Daud. or the genus COLOBUS, Merr.; but all these genera are reducible to one single species.

latter by the presence of the anterior feet. One species only is known.

Chamæsaura propus, Schn.; _Lac. lumbricoïdes_, Shaw; _Bipède cannelé_, Lacep. I, xli. Two short feet, four toes to each, with a vestige of a fifth, their internal organization tolerably perfect, connected by scapulæ, clavicles and a small sternum; but the head, vertebræ, and in fact the whole remainder of the skeleton resembling that of the Amphisbænæ.

It is from eight to ten inches long, and about the thickness of the little finger; flesh coloured; the back invested by about two hundred and twenty half rings; there are as many on the belly, which meet alternately on the side. It is found in Mexico, where it feeds on insects. Its slightly extensible tongue terminates in two small horny points; eye very small; tympanum covered by the skin, and invisible externally; two series of pores before the anus. I found but one large lung, and a vestige of a smaller one, as in most Serpents.(1)

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(1) The genera which terminate this order of Saurians interpose themselves in so many various ways between the ordinary Saurians and the genera placed at the head of the Ophidians, that several naturalists now think it improper to separate the two orders; or they establish one, comprizing, on the one hand, the Saurians minus the Crocodiles,—and the Ophidians of the Anguis family on the other. But among the fossils of the ancient calcareous formations, we find two much more extraordinary genera, which, to the head and trunk of a Saurian, add feet attached to short limbs, and formed of a multitude of little articulations collected into a species of oar or fin, similar to the fins or fore feet of the Cetacea.

One of these genera, ICTHYOSAURUS, had a thick head attached to a short neck, enormous eyes, moderate tail, an elongated muzzle armed with conical teeth fastened in a groove. Different species, some of them very large, have been disinterred in England, France and Germany.

The other, PLESIOSAURUS, had a small head attached to a long serpentlike neck, composed of a greater number of cervical vertebræ than is found in any other animal known; its tail was short; some of its remains have also been found on the continent.

These two genera, for the possession of which we are chiefly indebted to the exertions of M. Home, Conybeare, Buckland, &c. inhabited the sea. They form a very distinct family, but what is known of their osteology approximates them much more closely to the common Saurians than to the Crocodiles, with which Fitzinger has associated them in his family of the LORICATA; and so much the more gratuitously, as neither their scales nor their tongue, the two characteristic parts of the Loricata, are known.

ORDER III.

OPHIDIA.(1)

Serpents are reptiles without feet, and consequently those which best merit that appellation. Their extremely elongated body moves by means of the folds it forms when in contact with the ground. They are divided into three families.

FAMILY I.

ANGUINA.(2)

The Angues still have an osseous head, teeth, and tongue, similar to those of a Seps; their eye is furnished with three lids, &c., and, in fact, if we may so express it, they are Sepes without feet; they are all comprised in the genus

ANGUIS, Lin.

Characterized externally by imbricated scales, with which they are completely enveloped. They have been separated into four subgenera; in the three first we still find beneath the skin the bones of the shoulder and pelvis.

PSEUDOPUS, Merr.

The tympanum visible externally, and on each side of the anus a small prominence(3) which contains a little bone analogous to the femur, connected with a true pelvis concealed under the skin. The anterior extremity hardly shows itself externally, its only mark being a fold not easily detected; it has no internal humerus. One of its lungs is a fourth less than the other. The scales are square, thick, and semi-imbricate, some of which, between those on the back and those on the belly, being smaller, occasion a longitudinal furrow on each side.

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(1) Οφις, a Serpent.

(2) *Anguis*, the Latin generic term for Serpents.

(3) *Pseudopus*, i. e. false foot. I have never been able to discover any division of the extremity of this very small vestige of a foot. M. Schneider has been equally unsuccessful.

Pallas has described a species of the south of Russia, which is also found in Hungary, and in Dalmatia; the *P. Pallasii*, Nob.; *Lacerta apoda*, Pall. Nov. Com. Petrop. XIX, pl. ix, f. 1; from twelve inches to two feet in length; scales on the back smooth; those on the tail carinated.

M. Durville has discovered another in the Archipelago, *Ps. Durvillii*, Nob., whose dorsal scales are rough and carinate like those on the tail. The

Ophisaurus, Daud.(1)

Only differs from the preceding subgenus in the entire deficiency of any external appearance of posterior extremities; the tympanum, however, is still visible, and the scales also form a fold on each side of the body. The small lung is one third as large as the other.

The most anciently known species, *Oph. ventralis; Ang. ventralis*, L., Catesb. II, lix, is common in the United States. It is of a yellowish-green, spotted with black above; the tail longer than the body; so easily broken that it is commonly termed the Glass-Snake.(2)

Anguis, Cuv.

No external appearance whatever of an extremity; the tympanum even being concealed under the skin; the maxillary teeth compressed and hooked, but none in the palate. The body is surrounded with imbricated scales, but has no fold on the side. One of the lungs half the size of the other.

One species is very common throughout Europe; *Anguis fragilis*, L.; Lacep. II, xix, 1, which has very smooth, shining scales, silvery yellow above and blackish beneath; three black lines along the back, which change by age into various series of points, and finally disappear. Its tail is as long as the body, the whole animal being a foot and some inches; it feeds on lumbrici and insects, and produces its young living.(3)

These three genera still have an imperfect pelvis, a small sternum, a scapula and clavicle, hidden under the skin. The absence of all these bony parts compels us to separate the subgenus I call

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(1) From ὄφις a Serpent, and σαυρὸς, a Lizard.

(2) Add *Ophis punctatus; Oph. striatulus*, Nob. two new species.

(3) The *Anguis erix*, L. is merely a young specimen of the fragilis, in which the dorsal lines are still well marked; the *A. clivicus*, of which Daudin makes an Erix, no one knows why, is an old animal of the same species, with a truncated tail. It is only quoted from Gronovius, who cites the Coluber of Gesner. This Coluber is an old *fragilis*.

ACONTIAS, CUV.(1)

Which still resembles the preceding in the structure of the head, and in the eye-lids, but in which there is no sternum, nor vestige of a shoulder or pelvis. The anterior ribs unite with each other beneath the trunk, by cartilaginous prolongations. I have only found one moderate sized lung, and another that is very small. The teeth are small and conical, and I think I have perceived them in the palate. These animals are easily recognized by their muzzle, which is enclosed as in a sort of mask.

The well known species, *Anguis meleagris*, L., Seb. II, xxi, 1,(2) inhabits the Cape of Good Hope. It resembles the *A. fragilis*, but its obtuse tail is much shorter; eight longitudinal rows of brown spots decorate its back. The same country produces other species, one of which is completely blind, the *Ac. cæcus*, Cuv.

FAMILY II.

SERPENTIA.

The true Serpents, which are by far the most numerous, comprise the genera without a sternum, and in which there is no vestige of a shoulder, but where the ribs still surround a great part of the circumference of the trunk, and where the body of each vertebra is still articulated by a convex surface to a cavity in the succeeding one; the third eye-lid and the tympanum are deficient; but the malleus of the ear exists under the skin, and its handle passes behind the tympanum. There is still a vestige of a posterior limb, concealed under the skin, in several of this family, and which in some of them shows its extremity externally in the form of a small hook.(3)

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(1) Acontias (javelin) the Greek name of a Serpent, which was believed to dart upon the passenger, from ἀκοντίζω, jaculor.

(2) Daudin has also made an *Erix* of the *Anguis meleagris*, but without any reason, for its inferior scales are not larger than the others. I have ascertained by dissection that this Serpent has no sternum, so that the supposition of M. Oppel to the contrary is erroneous.

(3) See the dissertation (German) of M. Mayer on the posterior extremities of Ophidians, in the twelfth vol. des Curieux de la Nature of Bonn.

We subdivide them into two tribes.

That of the AMPHISBÆNÆ, as in the preceding reptiles, still has the lower jaw supported by a tympanal bone directly articulated with the cranium, the two bunches of this jaw soldered together in front, and those of the upper one fixed to the cranium and to the intermaxillary bone, circumstances which prevent that dilatation of the mouth which obtains in the succeeding tribe, and which occasions a uniformity of the head and body, a form which enables them to move backwards or forwards with equal facility. The bony frame of the orbit is incomplete behind, and the eye very small; the body is covered with scales, the anus close to its extremity, the trachea long, and the heart very far back. They are not venomous.

They form two genera, one of which is allied to Chalcides and Chirotes, and the other to Anguis and Acontias.

AMPHISBÆNA, L.(1)

The whole body surrounded with circular ranges of quadrangular scales, like the Chalcides and the Chirotes among the Saurians; a series of pores before the anus, a few conical teeth in the jaws, but none in the palate. There is but one lung.

Two species have long been known, *Amph. alba*, Lacep. II, xxi, 1; and *Amph. fuliginosa*, L., Seb. II, xviii, 2, C. 3 and lxxiii, 4, both from South America. They feed on insects, and are often found in ant-hills, which has occasioned a belief among the people that the large ants are their purveyors. They are oviparous.(2)

There is another in Martinique entirely blind, *Amph. cæca*, Cuv.(3)

The LEPOSTERNON, Spix, are Amphisbænæ, the anterior part of whose trunk has a collection of plates above which interrupts the rings. They have no anal pores, their head is short, and their muzzle somewhat elongated.(4)

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(1) From αμφις and ϐαινειν, walking both ways. The ancients attributed two heads to it. This name has been erroneously applied to some American Serpents, which it is impossible the ancients could have known.

(2) The *Amph. flavescens*, Pr. Max. Lib. IX.

(3) May it not be the *A. vermicularis*, Spix, XXV, 2? he says, "*occuli vix conspicui*"—I can see none. He employed the same expression for his *A. oxyura*.

(4) *Lep. microcephalus*, Spix, or *Amph. punctata*, Pr. Max.

Typhlops, Schn.(1)

The body covered with small imbricated scales like Anguis, with which they were long classed; the projecting muzzle furnished with plates;(2) tongue long and forked; the eye resembling a point hardly visible through the skin; the anus close to the very extremity of the body; one of the lungs four times larger than the other. They are small serpents, at the first glance resembling earth-worms; they are found in the hot portions of both continents.

In some of them the head and body are of one uniform appearance, the former obtuse. They resemble pieces of slender twine.(3)

Most of them have a depressed and obtuse muzzle, furnished before with several plates.(4)

The front of the muzzle in some is covered with a single large plate, the anterior edge of which is somewhat trenchant.(5)

Finally, there is another whose muzzle is terminated by a little conical point, and which is entirely blind. Its posterior extremity is enveloped with an oval and horny shield.(6)

In the second tribe, that of the Serpentes, or Serpents, properly so called, the tympanal bone or pedicle of the lower jaw is movable, and is itself always suspended to another bone, analogous to the mastoid process, attached to the cranium by muscles and ligaments, which allow it some motion. The branches of this jaw are not so closely united with each other, and those of the upper one are merely connected with the intermaxillary bone by ligaments, so that they can separate to a greater or less extent, which enables these animals so to dilate their mouths as to swallow bodies larger than themselves.

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(1) Τύφλωψ, τυφλίνη, blind, were the names of the Anguis (slow-worms) among the Greeks. Spix has substituted Stenostoma.

(2) I could find no teeth in those I examined.

(3) *T. braminus*, Nob. or *Rondos-talaloopam*, Russel, Serp. Corom. XLIII, or *Eryx braminus*, Daud. or *Tortrix Russelii*, Merr.

(4) *Ang. reticulatus*, Sch., phys. sacr. pl. dccxlvii, 4;—*Typhlops septemstriatus*, Schn.;—*T. crocotatus*, Id.;—*T. leucorhous*, Oppel., &c. Seb. I, vi, 4, is a species of this subdivision.

(5) *Ang. lumbricalis*, Lacep. II, pl. xx, Brown, Jam., XLIV, 1, Seb. I, lxxxvi, 2;—*T. albifrons*, Opp. In this genus, as in all others where the species are very similar, the latter have not been well determined; it is well worthy of a monograph. We are acquainted with at least twenty species.

(6) *Typhlops philippinus*, Nob. Eight inches long, all blackish. The *T. oxyrhynchus*, Schn. must be closely allied to it.

Their palatine arches participate in this facility of motion, and are armed with sharp pointed teeth which curve backwards, the most predominant and constant character of the tribe. Their trachea is very long, their heart very far back, and most of them have but one large lung with a vestige of another.

Serpents are divided into venomous and non-venomous; and the former are subdivided into such as are venomous with several maxillary teeth, and those which are venomous with insulated fangs.

In such as are not venomous, the branches of the upper jaw as well as those of the lower one, and the palatine arches, are every where furnished with fixed and solid teeth; there is then four equal rows of these teeth in the upper part of the mouth, and two below.(1)

Those which have the mastoid processes comprized in the cranium, the orbit incomplete behind, and a thick, short tongue, still retain much similitude to the *Amphisbænæ* in the cylindrical form of their head and body, and were formerly united with Anguis on account of their small scales. They constitute the

TORTRIX, Oppel.(2)

And are otherwise distinguished from the Anguina, even externally, inasmuch as the scales which form the range along the belly and under part of the tail are a little larger than the others, and the tail itself is extremely short. They have but one lung.

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(1) The common opinion respecting them is, that those which are destitute of the pierced fangs in front of the jaws are not venomous, but I have some reason to doubt its correctness. They all have a maxillary gland, which is frequently very large, and their back molars exhibit a groove which may serve to convey some fluid. It is very certain that several of the species in which the back molars are very large, are accounted extremely venomous in the countries they inhabit, and that the experiments of Lalande and Leschenault have served to confirm that opinion; their repetition is much to be desired.

(2) They are the ANILIUS, Oken, the TORQUATRIX, Gray, and the ILYSIA, Hemprich and Fitzinger.

The species known are from America, the most common must be

Anguis scytale, L. Seb. II, xx, 3. Two feet long, irregularly annulated, white and black.(1) The

Uropeltis, Cuv.

Is a new genus allied to Tortrix, in which the tail is still shorter and obliquely truncated above, the truncated surface flat and studded with granules. The head is very small, the muzzle pointed; there is a range of scales along the belly somewhat larger than the others, and a double range of them under their stump of a tail.(2)

In those non-venomous Serpents, on the contrary, where the mastoid bones are detached, and the jaws are susceptible of great dilatation, the occiput is more or less enlarged, and the tongue forked and very extensible.

They have long been divided into two principal genera, Boa and Coluber, distinguished by the simple or double plates on the under part of the tail. The genus

Boa, Lin.(3)

Formerly comprized all those Serpents, venomous or not, the under part of whose body and tail is furnished with uninterrupted, transverse scaly bands, and which have neither spur nor rattle at the end of the tail. As they are rather numerous, even after deducting the venomous species, the others have been again subdivided.

The Boa, properly so called, has a hook on each side of the anus, a compressed body, thickest in the middle, a prehensile tail, and small scales on the head, at least on its posterior portion. It is in this genus that are found the largest serpents on the globe; certain species attain a length of thirty or forty feet, preying on dogs, deer, and even oxen, which they manage to swallow entire, after having crushed them in their folds and covered them with saliva. This operation requires much time and an enormous dilatation of their jaws and throat. Their small lung is but half the length of the other.

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(1) Add *Ang. corallinus*, Seb. II, lxxiii, 2, 1, 3, which is perhaps a mere variety of the *scytale*;—*Ang. ater*, Id. XXV, 1, and VII, 3;—*Tortr. rufa*, Merr., which seems to me a variety of the *atra*;—*Ang. maculatus* and *tessellatus*, Seb. II, c. 2; *F. latta*, N. Seba, II, xxx, 3; Russel, XLIV;—*Tort. punctata*, Nob., Seb. II, 11, 1, 2, 3, 4, and VI, 1, 4.

(2) *Uropeltis ceylanicus*, Nob.;—*Urop. philippinus*, two new species similar to the Tortrices even in colour.

(3) *Boa*, the name of certain Italian Serpents of great size, most probably the four striped Coluber, or Serpent of Epidaurus of the Latins. Pliny says they were thus named, because they sucked the teats of Cows. The Boa, 120 feet long, which it is pretended was killed in Africa by the army of Regulus, was probably a Python. See Pliny, lib. VIII, cap. xiv.

The integuments of the head and jaws of these serpents furnish materials for a still further subdivision.

1. In some the head down to the tip of the muzzle is covered with small scales similar to those on the body, and the plates on the jaws are not pitted. Such is the

Boa constrictor, L; *Le Devin*, Lacep. II, xvi, 1; Seb. I, xxxvi, 5, liii, 11, lxxxviii, 5, xcix, 1, ci; *Devin* or *Boa empereur* of Daudin.(1) Known by a broad chain, which extends along the back, formed alternately by large, blackish, irregularly hexagonal spots, and by pale oval ones, the two ends of which are emarginate.

2. In others there are scaly plates from the eyes to the end of the muzzle, but no fossulæ on the jaws.

Boa scytale and *murina*, L.; *Anaconda*, Seb. II, xxiii, 1, and xxix, 1; *B. aquatica*, Pr. Max. liv. II. Brown; a double suit of round black spots along the back; ocellated spots on the flanks.

3. Some have scaly plates on the muzzle, and little pits or fossulæ on the lateral plates of the jaws.

Boa cenchris, L.; *Aboma* and *Porte Anneau*, Daud.; Seb. I, lvi, 4, II, xxviii, 2, and xcviii; *Boa cenchrya*, Pr. Max. liv. VI. Fawn coloured with a suite of large brown rings along the back, and variable spots on the flanks.

These three species, which attain a nearly equal size, inhabit the marshy grounds of the hot parts of South America; winding their tail round some aquatic tree, they dart their floating body upon the quadrupeds which come there to drink.

4. Some have plates on the muzzle, the side of the jaw being

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(1) Daudin thinks that the *Devin* is to be found in the eastern continent, but it is certainly from Guiana. Vaillant and Humboldt have procured it there. Pr. Max. has found it in Brazil. The two succeeding species were also brought from Surinam by M. Le Vaillant, and it is well known that the *Bojobi* inhabits Brazil. I do not think there is any large Boa, properly so styled, in the eastern world. The great Serpents of Africa and India are Pythons. The name *Devin* arises from the circumstance of having improperly applied to this Serpent what is stated respecting certain large Colubers, which constitute the Fetiches of some negro tribes.

grooved so as to resemble a slit beneath the eye, and further back.(1)

5. Finally, there are others in which the fossulæ are wanting, but whose muzzle is furnished with slightly prominent plates, cut obliquely from behind forwards, and truncated at the end, so that they terminate in a wedge. Their body is greatly compressed, and their back carinated. These inhabit the East Indies, and may constitute a distinct subgenus.(2) Schneider has separated from Boa his

Pseudo-boa.—Scytale, Merr.

Which has plates like the Coluber, not only on the muzzle, but also on the cranium; no fossulæ, a round body, and the head and trunk one uniform piece, as in Tortrix.(3) Daudin also has separated from it the Erices, or

Erix, Daud.(4)

Which differ in the tail, it being short and obtuse, and in the ventral scales which are narrower. Their head is short, and nearly of one uniform piece with the body; these characters would approximate them to Tortrix if the conformation of their jaws did not forbid it; besides, the head is only covered with small scales. There is no hook near the anus. We may approximate to these the

Erpeton, Lacep.(5)

Very remarkable for two soft prominences covered with scales on the end of the muzzle. The head is furnished with large plates, those on the belly have but little breadth, and the sub-caudal ones hardly differ from the rest; the tail itself, however, is long and pointed.(1)

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(1) The *Boa broderie* (*B. hortulana*, L.), Seb., II, lxxxiv, 1, and the *élégant*, Daud. V, lxiii, 1, which is the same;—the *Bojobi* (*B. canina*, L.) Seb., II, lxxxi and xcvi, 2, or *Xiphosoma araramboja*, Spix, XVI. The *B. hipnale*, Seb. II, xxxiv, 1, 2, and Lacep. II, xvi, 11, appears to be nothing more than a young *Bojobi*;—the *B. Merremii*, Schn., Merr. betyr. II, ii, or *Xiphosoma dorsale*, Spix, XV, of which Daud. has made his genus Coralle, from the probably accidental and individual character of the two first plates under the neck being double.

(2) The *B. carinata*, Schn., or the *ocellata*, Opp.;—the *B. viperina*, Sh. Russel, pl. iv. N.B. These two subdivisions form the genus Xiphosoma, Fitz. the Cenchris of Gray.

(3) *Scyt. coronata*, Merr., Seb. II, xli, 1, Pr. M. liv. VII. N.B. The Scytale of Merrem must not be confounded with that of Daudin, which is the Echis of Merrem.

(4) *Erix* (hair), name applied by Linnæus to a species of Anguis.

(5) Ερπετὸς, Serpent.

COLUBER, Lin.(2)

This genus comprised all those serpents, venomous or not, whose sub-caudal plates are divided in two, that is, which are arranged by pairs.

Independently of the subtraction of the venomous species, their number is so enormously great, that naturalists have had recourse to all sorts of characters to subdivide them. We may separate in the first place the

PYTHON, Daud.

Hooks near the anus and narrow ventral plates as in Boa, from which these serpents only differ in their double sub-caudal plates. The end of the muzzle is furnished with plates, and their lips are pitted.

Some species are as large as any Boa: such is the *Ular-Sawa* or *Great Coluber of the Sunda Islands*, *Col. javanicus*, Sh., which has been found more than thirty feet in length. Seb. I, lxii; II, xix, 1; xxviii, 1; xcix, 2.(3)

The last caudal plates in some of these Pythons, and the first in others, are simple.(4) This may sometimes be an accidental difference.

CERBERUS, Cuv.

Nearly the whole of the head, as in the Pythons, covered with small scales, and no plates but what are found between and before the eyes; but the hooks at the anus are wanting. Sometimes there are simple plates at the base of the tail.(5)

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(1) *Erpeton tentaculé*, Lacep. Ann. Mus. II, 1, a name given to this genus by Lacep. who first described it; Merrem has substituted RHINOPIRUS.

(2) *Coluber*, a generic name for Serpents among the Latins.

(3) This *Ular-sawa* or *Python améthiste*, Daud., *Boa amethystina*, Schn., of which we possess one great skeleton and several skins, brought from Java by M. Leschenault, is at least closely allied to the *Pedda-poda* of Bengal (*Python tigre*, Daud.), Russel, XXII, XXIII, XXIV, *Col. boæformis*, Sh., *Boa castanea* and *albicans*, Schn.; and it appears to us that all the pretended species of Boa of the eastern continent are in fact Pythons. *Ular-sawa*, in the Malay language, signifies the River-Serpent. The *B. reticulata*, *ordinata*, *rhombeata*, Schn. are all Pythons.

(4) The *Bora*, Russ., XXXIX (*Boa orbiculata*, Schn.).

(5) We have seen these plates simple in one individual, and double in others of the same species, a proof of the little importance of this character. To this

XENOPELTIS, Reinw.

Large triangular and imbricated plates behind the eyes, becoming confounded with the succeeding ones, which merely decrease in size.(1)

HETERODON, Beauv.

The usual plates of a Coluber, but the end of the muzzle is one single piece, short, and resembling in form a slightly elevated triedralpy ramid, one ridge being above; from which circumstance they have been called Hog-noses.(2)

HURRIA, Daud.

Small Colubers of India, in which the plates on the base of the tail are always simple, and those on the point double; these anomalies, however, merit but little attention.(3)

DIPSAS, Laurent.—BUNGARUS, Oppel.

The body compressed, much narrower than the head; scales of the spinal range larger than the others, a circumstance which we shall find again in Bongarus. Such is the

D. indica, Nob.; *Colub. bucephalus*, Sh.; Seb. I, xliii.(4) Black, ringed with white.

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group belong the *Col. cerberus*, Daud., Russel, pl. xvii;—*Homolopsis obtusatus*, Reinw. and the neighbouring species.

(1) *Xenopeltis concolor*, Reinw.

(2) The *Hétérodon noirâtre*, Beauv., *hétérodon*, Daud., and the *hétéredon tacheté* (*Cenchris mokeson*, Daud.) belong to this genus; but Beauvois has established it on a character which is found in a great many Colubers, viz. that of the posterior maxillary teeth being the largest; and Daudin appears to have known his *Mokeson* by a drawing only, we mean the *Hog-nose* of Catesby, II, pl. lvi, which Daud. himself has cited. A part of its tail-plates is sometimes entire; but at the base, and not near the point, as Daud. describes it. Linnæus had correctly indicated this Serpent in his tenth edition, under the name of *Coluber constrictor:* why he changed it in the twelfth to *Boa contortrix*, is not known. [N.B. The author in this note seems to have confounded three species of Serpents which are indubitably distinct—the *Heterodon*, the *Trigonocephalus tisiphone* or *Mockason Snake*, and the *Coluber constrictor* or *Black Snake*. The Heterodon is a harmless animal, and has the plates on the top of the head arranged 3, 2, 3, 2. *Am. Ed.*]

(3) *Hurriah*, a barbarous name, taken from that which designates the species, Russ., XL, copied Daud. V, xlvi, 2. Another, Merr. II, iv.

(4) *Dipsas*, the Greek name of a Serpent whose bite was thought to cause a fatal thirst, from δίψα, thirst. The fig. of Conrad Gesner, at the word *Dipsas*, is precisely of this subgenus. The *Dip. indica* is altogether different from the

Dendrophis, Fitz.—Ahœtulla, Gray.

The scales of the spinal range larger, as in Dipsas, and those along the flanks narrower; but their head is not broader than the body, which is very long and slender: the muzzle obtuse.(1)

Dryinus, Merr.—Passerita, Gray.

The body as long and slender as in the preceding subdivision; but there is a little slender and pointed appendage to the end of the muzzle.(2)

Dryophis, Fitz.

The same elongated form, the muzzle pointed, but no appendage; scales equal.(3)

Oligodon, Boié.

Small Colubers, with a short, narrow, obtuse head, in which the palatine teeth are wanting.

The various remaining subgenera which have been separated from that of Coluber, appear to us less worth retaining; they are founded upon slight variations in the proportions of the head, thickness of the trunk, &c.(4) After all these divisions, the Colubers are more numerous in species than any other genus of Serpents. Several are found in France, such as

Col. natrix, L.; *Coulevre à collier*, Lac. II, vi, 2. (The Ringed Snake.) Cinereous, with black spots along the flanks, and three white ones on the neck, forming a collar; scales carinate, that is ridged. Very common in meadows and stagnant

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Vipera atrax, Mus. Ad. Fred. XXII, 2, with which Linnæus, Laurentini and Daudin have confounded it.

(1) *Col. ahætulla;—Col. decorus*, Shaw;—*Col. caracaras*, Id., (*Bungarus filiformis*, Oppel.) to which I add the Sibon, Fitz.; at least in the *Col. catenulatus*, Russ. pl. xv, the dorsal scales are rhomboidal and larger, as in the *ahætulla.*

(2) *Col. nasutus*, Russ. Serp. pl. xii and xiii.

(3) *Col. fulgidus*, Daud., VI, lxxx, Seb., II, liii, 9;—*Dryinus æneus*, Spix, III.

(4) By this I particularly mean the Tyria, Malpolon, Psammophis, Coronella, Xenodon and Pseudoelaps of Fitzinger. At most, we could only adopt his Duberria, where the head is short, obtuse, and on one uniform line with the body as in Elaps; and his Homalopsis, in which the eyes are rather more vertical than in the other Colubers. I have separated Cerberus. Laurentini had previously endeavoured to divide the Colubers into Coluber and Coronella; the latter were those in which the scales on the sides of the temporal plates are large enough to be counted as so many plates more; but the transitions from one group to another are almost insensible.

waters; it feeds on frogs, insects, &c. and is eaten in several of the provinces.

There is a closely allied species in Sicily which is much larger, and has a black collar, the *Col. siculus*, Nob.

Col. viperinus, Latr.; *La Viperine.* Grey-brown; a suite of black spots forming a zigzag along the back, and another of smaller ocellated ones along the sides, a kind of colouring which gives it a resemblance to the Viper; beneath chequered with grey and black; scales carinated.

Col. austriacus, Gm.; *La Lisse*, Lacep. II, ii, 2. Brown-red; marbled beneath with steel colour; two ranges of small blackish spots along the back; scales smooth, each with a small brown dot near the point.

Col. atro-virens; La Verte et jaune, Lacep. II, vi, 1. Spotted with black and yellow above; beneath, of a greenish yellow; scales smooth.

The south of France and Italy produce

Col. girondicus, Daud., which has nearly the same colours as the *viperinus*, but the scales are smooth, and the dorsal spots smaller and more apart.

Col. elaphis, Sh.; *La Quatre-Raies*, Lacep. II, vii, 1. Fawn colour, with four brown or black lines on the back. It is the largest of the European serpents, and sometimes exceeds six feet. We have reason to think it is the *Boa* of Pliny.

Col. Æsculapii, Sh.(1) (The Serpent of Æsculapius.) Stouter than the elaphis, but not so long; brown above; straw colour beneath and on the flanks; dorsal scales nearly smooth. Found in Italy, Hungary, and Illyria. It is represented by the ancients in their statues of Æsculapius, and the serpent of Epidaurus was probably of this species.

The Colubers, foreign to Europe, are innumerable; some are remarkable for the vividness of their colours, others for the regularity of their distribution; the tints of several are tolerably uniform. But few of them attain a very large size.(2)

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(1) N.B. The *Col. Æsculapii*, Lin. is a very different, and an American species.

(2) The Colubers presenting but few variations of structure that are interesting, I have not thought it necessary to enter into the long catalogue. It will be found in the works of Merrem, Gmelin, Daudin, and Shaw. It is necessary, however, to consult them with much caution and critical nicety: they abound in transpositions of synonymes, &c. For instance, the *Col. viridissimus* and the *Col. janthinus*, Merr., I, xii, only differ from the effects of the spirit of wine;—the *Col. horridus*, Daud. Merr. II, x (*Col. viperinus*, Shaw), is the same as the *demi-collier*. Lac., II, viii, 2;—the *Coul. violette*, Lacep., II, viii, 1, and the *Col. reginæ*, Mus. Ad.

ACROCHORDUS, Hornst.

This genus is easily known by the little uniform scales which cover the head and body, both above and beneath. In the species known,

A. javensis, Lac. II, xi, 2; *Anguis granulatus*, Schn.; *Oular caron* of Java; each of the scales is relieved with three small ridges, which, when the skin is well stuffed, resemble insulated tubercles. It attains a large size. Hornstedt erroneously states it to be frugivorous—a singular habit for a serpent.(1)

Serpents which are venomous, par excellence, or those with isolated fangs, have their organs of manducation constructed on a very peculiar plan.

Their superior maxillary bones are very small, attached to a long pedicle, analogous to the external pterygoid apophysis of the sphenoid bone, and are very movable; in them is fixed a sharp pointed pervious tooth, through which flows a liquor secreted by a large gland, situated under the eye. It is this liquor which, poured into the wound made by the tooth, produces effects, more or less violent, according to the species of the reptile in which it is secreted. This tooth, when the animal does not wish to use it, is concealed in a fold of the gum, and behind it are several germs destined to replace it, in the event of its being broken in a wound. These venomous teeth have been termed by naturalists movable fangs, but in fact it is the maxillary bone which moves; there are no other teeth in it, so that in this kind of dangerous serpents only the two rows of palatine teeth are to be seen in the upper part of the mouth.

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fr. XIII, 2, only differ by the action of the spirit. Such, also, should be considered the *Col. lineatus*, Seb. XII, 3; Mus. Ad. Fr. XII, 1, xx, 1;—the *Col. jaculatrix*, Seb., I, 9, Scheuchz, DCCXV, 2;—the *Col. atratus*, Seb. I, 9, ix, 2, and even the *terlineatus*, Lacep. II, xiii, 1;—the *Col. sibilans*, Seb. I, ix, 1, II, lvi, 4; and the *Coul. chapelet*, Lacep. II, xii, 1, appear equally alike, as well as the *Col. Æsculapii*, Jacq. and the *flavescens*, Scopol. &c. &c. &c. As to the transposition of synonymes, they are innumerable. N.B. The ENHYDRUS of Daud. would be non-venomous Colubers, with a compressed tail, but the only species he cites, *Anguis xyphura*, Herm. aff. an p. 269, and Obs. Zool. p. 288, is evidently a Hydrophis or a Pelamis.

(1) We have never been able to discover the particular bone Oppel says he observed in the Acrochordus, as taking the place of the poison-fangs, and M. Leschenault assures us that the Acrochordus is harmless.

All these venomous species, whose mode of production is well known, bring forth living young ones, as their eggs are hatched without being laid, from which circumstance is derived their common name of *Vipers*, a contraction of viviparous.

Venomous serpents with insulated fangs have external characters very similar to those of the preceding ones, but in the greater number the jaws are very dilatable, and the tongue very extensible. The posterior portion of their head being broad, generally gives them a ferocious aspect, which is a partial indication of their disposition. They form two great genera, CROTALUS and VIPERA, the second of which has been variously subdivided, and some smaller ones which group around them.

CROTALUS, Lin.(1)

Rattlesnakes are pre-eminently conspicuous for the intensity of their venom. As in Boa, there are transverse simple plates under the body and tail; but their most distinguishing character is the rattle which terminates the tail. It is formed by several scaly cornets loosely fitted into each other, wkich move and produce the peculiar noise from which they receive their name whenever they crawl or shake that part of the body. The number of these cornets increase with age, an additional one being always found after each moult. There is a little round indentation or pit behind each nostril.(2) All the species whose habitat is well ascertained are from America. The danger resulting from the bite of these noxious reptiles is in proportion to the warmth of the climate or of the season; their natural disposition, however, is tranquil, and they are rather slow and heavy in their motions, never biting unless provoked, or to kill the prey on which they feed.

Although the Rattlesnake never ascends trees, its principal food consists of birds, squirrels, &c. It has long been supposed that it possesses the faculty of rendering them powerless by its breath, or even of *charming* them, as it is called, by which they are compelled to leap into its mouth; this, however, is not so, and the reptile in question seizes its prey while under the agitation and terror produced by its appearance.(1)

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(1) Crotalus, from κρόταλον.

(2) See Russel and Home, Phil. Trans. 1804, pl. iii, p. 76.

In most of the species there are scales on the head similar to those on the back.

Crot. horridus, L.; Catesb. II, xli, is the species most common in the United States; brown, with irregular blackish transverse bands. That of Guiana, *Crot. durissus*,(2) Lacep. II, xiii, 2, has lozenge shaped spots edged with black, and four black lines along the top of the neck; both species are equally to be dreaded, as death speedily follows a wound from their fangs. They are sometimes found six feet in length.

The head of some species is furnished with large plates.(3)

We should approximate to the Rattlesnakes the

Trigonocephalus, Oppel.—Bothrops, Spix,—Cophias, Merr.

Distinguished from them by the want of a rattle, but having the same pits behind the nostrils, and being equally venomous.

The sub-caudal plates in some of them are simple, as in the Rattlesnake, their head being covered with plates to behind the eyes; their tail terminates in a small horny spur.(4) Such is

Colub. tisiphone, Shaw; Catesb. II, xliii and xliv. Brown, clouded with spots of deeper brown.

In others the sub-caudal scales are double, and the head is covered with scales similar to those on the back.(5) Such among others is

Trig. lanceolatus, Opp.;(6) *Serpent jaune des Antilles*, Lacep. II, v. 1. (The Lance-headed Viper.) The most dangerous reptile of the French Sugar islands; it is yellowish or greyish, more or less varied with brownish, and attains the length of six feet; it lives among the sugar-canes, where it feeds on rats and occasions the death of many of the slaves.(1)

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(1) See Barton, *Memoir on the power of fascination attributed*, &c. Philad. 1796.

(2) These names of *durissus* and *horridus* have been variously applied to these two species.

(3) It is this subdivision which furnished M. Gray with his genus Crotalophorus, and M. Fitzinger with that of *Caudisona*. The *Crot. miliaris*, L. Catesb. II, xlii, belongs to it.

N.B. The *C. horridus* or the *Diamond Rattlesnake*, the *C. durissus* or the *Banded Rattlesnake*, and the *C. miliaris* or the *Ground Rattlesnake*, a smaller species, but the most dangerous of the three, all inhabit the United States. The most common is the *durissus;* the *miliaris*, although furnished like the others with an apparatus of three or four cornets at the end of the tail, can make no noise with them. The plates on the head are arranged as in the genus Coluber. *Am. Ed.*

(4) They are the Tisiphone of Fitzinger.

(5) In the work of M. Fitzinger this division is called Craspedocephalus; all the Bothrops, Spix, pl. xix—xxiii, belong to it.

(6) This species inhabits Brazil, and most probably other parts of South America; I am even inclined to think it is the *Souroucou* of Spix, pl. xxiii, which he considers the *Crot. mutus* or *lachesis*.

The head of some of these Trigonocephali with double subcaudal scales is furnished with plates.(2)

Others, along with the small scales on the head, have double plates beneath the tail, with the exception of the very extremity, which is merely furnished above and beneath with small imbricated scales, and terminates in a little spur.(3) Of this number is the

Crot. mutus, L.; *Col. alecto*, Sh.; Seb. II, lxxvi, 1; *Lachesis rhombeata*; Pr. Max. No. V. Yellowish; the back marked with large black or brown lozenges; scales raised in the middle. It is found six and seven feet long, and is quite as formidable as the Rattlesnake.

VIPERA, Daud.

The Vipers, most of which were confounded with the Colubers by Linnæus, on account of their double sub-caudal plates, require to be separated from them from the circumstance of their having poisonous fangs. There are also some serpents which naturally belong to this division, whose sub-caudal plates are either wholly or partially simple. They are all distinguished from the Rattlesnakes and the Trigonocephali by the absence of the pits behind the nostrils.

In some the head is only furnished with imbricated and carinated scales like those on the back.(4) Such is

Vip. brachyura, Cuv.; Seb. II, xxx, 1. (The Minute Viper.) The intensity and activity of its poison render it one of the most terrible of the genus.(5)

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(1) Here comes the *Trimérésure vert*, Lacép., An. Mus. IV, lvi, 2, or *Boodropam*, Russel, Serp. Corom., IX, which sometimes has two or three entire plates under the root of the tail; this, however, is but an individual accident.—Add, *Cophias bilineatus*, Pr. Max. No. V;—*C. atrox*;—*C. jacaraca*.

(2) Fitzinger appropriates the name of TRIGONOCEPHALUS to this subdivision.

(3) It is the genus LACHESIS, Daud., adopted by Fitzinger, but badly characterized; the sub-caudal plates are certainly double, almost to the very end, where there is nothing but very small scales. Pr. Max. gives a correct view of it.

(4) This, with the following division, forms the subgenus ECHIDNA of Merrem, which, with his *Echis*, of which we shall speak hereafter, composes his genus VIPERA. Fitzinger arranges our three first divisions in three genera, which he names VIPERA, COBRA, and ASPIS.

(5) Add the *Aspic*. Lacep. II, ii, 1 (*Vip. ocellata*, Lath.), a large species allied to the *atropos*, Lin. Mus. Ad. Fred. XIII; but very different from the *aspis* of Linnæus, which is a mere variety of the common species;—*Vip. Clotho*, Seb. II, xciii, 1;—*Vip. lachesis*, Id., XCIV, 2;—the *Daboie*, Lacep., II, xiii, 2, or the *brasilienne*, Id. IV, 1;—the *Vip. élégante*, Daud., Russel, VII, &c.

In others the head is covered with small granulated scales, as for instance,

Col. berus, L. (The Common Viper.) Brown; a double row of transverse spots on the back; a range of black or blackish spots on each flank. Sometimes the dorsal spots coalesce in transverse bands, and at others they all form one zig-zag longitudinal band, in which state it is the *Colub. aspis*, L.,(1) which is sometimes called *Aspic* in the neighbourhood of Paris. Individuals are found perfectly black.(2)

Vip. illyrica, Aldrov. 169; *Col. ammodytes; Vipère à museau cornu;* Jacquin., Collect. IV, pl. xxiv and xxv. Similar to the common species, but particularly distinguished from it by a small soft horn covered with scales that projects from the end of its muzzle. It is found in Dalmatia, Hungary, &c.

Col. cerastes, L.; *Le Ceraste*, Lacep. II, 1, 2. Remarkable for a small pointed horn on each eye-brow; it is greyish, and hides itself in the sand, in Egypt, Lybia, &c. It is often mentioned in the writings of the ancients.

Vip. lophophris, Cuv.; *Vipère à panache*, Voy. de Patterson, pl. xv. A little bundle of short horny threads on each eye-brow instead of the horn. From the environs of the Cape.

Other Vipers, similar in general to the preceding ones, have three plates somewhat larger than those which surround them on the middle of the top of the head.(3)

Col. chersea, L.; *Col. berus*, Laurent. and Daud. Very similar to the common Viper, and distinguished from it by the aforesaid three plates. It is a rarer and smaller species, and said to be more venomous.(4)

Some individuals are almost entirely black, called *Black Vipers—Colub. prester*, Laurent. pl. iv, f. 1.(5)

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(1) *Aspis*, a Serpent of Egypt, of which there were several species. One of them, from the dilatability of its neck, must have been the *Haje*.

(2) *Berus* is the name of a serpent only used by the authors of the middle century, such as Albert, Vincent de Beauvais, &c. and then for an aquatic species, probably the *Col. natrix*. The *Vipère de Charas*, of which Laurenti endeavoured to make a species, and which is the *Col. aspis*, Gmel., is the same as this common Viper, which, in my opinion, is the true *berus* of Linnæus, who on this point only cites Aldrov. 115, which is this species.

(3) This subdivision has furnished Merrem with his genus PELIAS.

(4) It is the *Æsping* of the Swedes (*æsping*, corruption of aspic) undoubtedly figured in the Stockhol. Mem. 1749, pl. vi. Laurenti, however, Spec. Medic. p. 97 and pl. ii, f. 1, has applied it to the name of *berus*. It is also the *Pelias berus*, Merr.; *Vip. berus*, Fitzinger.

(5) Prester, πρησθης, the Greek name of a Serpent, considered by several authors as identical with the *dipsas*, from πρηϑείν, to burn.

Next come those Vipers in which the head is furnished with plates almost like that of the Colubers.

Of this number some are so exactly similar to the most common Vipers, that there is nothing but these plates to distinguish them.(1) Such is

Col. hæmachates, L.; Seb. II, lviii, 1, 3. Reddish brown marbled with white; muzzle obliquely truncated beneath. From the Cape.

NAIA.

Vipers with the head furnished with plates, and the anterior ribs susceptible of being raised up and drawn forwards, so as to dilate that part of the trunk into a disc more or less broad. The most celebrated species is the

Col. naia, L.; *Naia tripudians*, Merr.; *Serpent à lunettes*, or *Cobra capello* of the Portuguese in India; Seb. II, 85, 1, 89, 1—4, &c.; Lacép. II, iii, 1, so called from a black line resembling the figure of a pair of spectacles traced on the widened portion of its disc. It is extremely poisonous, but it is said that the root of the Orphiorhyza mungos is a sure antidote against the effects of its bite. The jugglers of India tame and teach it to dance, having previously extracted the fangs. The same use is made of another species in Egypt, the

Col. haje, L.; *L'Haje*, Geoffr., Egypt. Rept. pl. vii; and Savign. Id. Suppl. pl. iii, whose neck is not so wide, and which is greenish bordered with brownish. The jugglers of that country, by pressing on the nape of the neck with their finger, throw it into a kind of catalepsy which renders it stiff and immovable, or *turn it into a rod*, as they term it. Its habit of raising itself up when approached, induced the ancient Egyptians to believe that it was the guardian of the fields it inhabited. They made it the emblem of the protecting divinity of the world and sculptured it on each side of a globe upon the gates of their temples. It is indubitably the serpent described by the ancients under the name of the *Asp of Egypt*, *Asp of Cleopatra*, &c.

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(1) Merrem has formed his genus SEPEDON from this subdivision. Add, *Col. v. nigrum*, Scheuchz., Phys. Sacr., IV, dccxvii.

N.B. The *Ophis*, Spix, Serp. XVII, must be a venomous serpent, similar to these Sepedons, but one whose poison fangs are preceded by some small simple teeth. Not having seen his species, I fear it is one of those Colubers with large posterior maxillary teeth before mentioned, several of which are at least liable to the suspicion of being poisonous.

ELAPS, Schn., partim.(1)

Vipers with a head furnished with plates, very differently organized from the Naiæ. They are not only deprived of the power of dilating their ribs, they cannot even dilate their jaws, on account of the shortness of the tympanal, and particularly of the mastoid bones, the result of which is, that their head, like that of the Tortrices and Amphisbænæ, is of one uniform piece with the body. The most common species, is

> *Col. lemniscatus*, L.; Seb. I, x, ult. and II, lxxvi, 3. A white ground marked with triple black rings; tip of the muzzle black. It inhabits Guiana where it is greatly dreaded, and where it causes an equal degree of fear to be extended to the *Tortrix scytale*, and the *Coluber Æsculapii*, although they are harmless, from their resemblance to it in form, size, and colours. There are several species of Elaps in the two continents with a nearly similar distribution of colours.(2)

MICRURUS, Wagl.

Elaps with a very short tail.

PLATURUS, Lat.

The head enveloped with plates, and double ones under the tail; the latter, however, is compressed in the form of an oar, which renders them aquatic.(3)

Finally, there are some serpents which should be placed next to the Vipers, only differing from them in their sub-caudal plates, some or all of which are simple. They are distinguished from the Tisiphones by having no pits behind the nostrils.

Sometimes the plates on the base of the tail are entire.

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(1) Schneider comprized among his Elaps all the serpents he supposed to be deficient in a separated mastoid bone, but of this he judged from external appearances, or the small degree of enlargement in the occiput; this character, therefore, is only true in the Tortrices of Oppel or Ilysia. He paid no attention either to their scales or their venom. Ελαψ, Ελοψ, are the Greek names of a non-venomous serpent.

(2) Such are *E. anguiformis*, Schn.;—the *Vip. Psyché*, Daud. VIII, c. 1;—*Col. lacteus*, Lin. Mus. Ad. Fr. XVII, 1, and better Seb. II, xxxv, 2;—*El. nob. surinamensis*, Seb. II, vi, 2, and lxxxvi, 1;—*Col. latonius*, Merr., I, 2, and Seb. II, xxxiv, 4, and xliii, 3, the same as the *Col. lubricus*;—*Col. flavius*, &c.

Add, *C. fulvus*, Gmel., of America. *Am. Ed.*

(3) *Le Plature à bandes* (*Col. laticaudatus*, L. or *Hydrus colubrinus*, Sh.), Daud. VII, lxxxv.

TRIMERESURUS, Lacep.

Large plates on the head; part of their plates double, the others simple.(1)

OPLOCEPHALUS, Cuv.

Large plates on the head; all the sub-caudals simple.(2)

ACANTHOPHIS, Daud.—OPHRIAS, Merr.

Plates on the fore-part of the cranium and head; tail terminated by a hook; almost all its scales simple, the extreme sub-caudal ones sometimes double.(3)

ECHIS, Merr.—SCYTALE, Daud.

The head covered with small scales; all the sub-caudal plates simple.(4)

LANGAHA, Brug.

Head covered with plates; muzzle salient and pointed; anterior half of the tail completely encircled with entire rings, and the posterior covered above and beneath with small imbricated scales.(5)

In addition to these two tribes of Serpents, properly so styled, a third has lately been recognized, in which the organization and armature of the jaws are nearly the same as in the non-venomous serpents, but where the first maxillary tooth, larger than the others, is perforated for the transmission of the poison, as in the venomous serpents with isolated fangs.

These serpents form two genera, distinguished, like those of the two neighbouring families, by the covering of the belly and the under part of the tail.

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(1) The *Trimérésure à petite tête*, Lacép. Am. Mus. IV, lvi, 1.

(2) The species are new.

(3) *Acanthophis cerastinus*, Daud., V, lxxvii; and Merr. Beytr. II, ix, or *Boa palpebrosa*, Sh.;—*Ac. Brownii*, Leach, Zool. Miscell. I, iii, the most venomous reptile that is found in the environs of Port Jackson.

(4) *Horatta pam.*, Russel, II, pl. 2, or *Boa horatta*, Sh., or *Pseudoboa carinata*, Schn., or *Scytale bizonata*, Daud., V, lxx;—*Pseudoboa krait*, Schn., or *Scytale krait*, Daud.

(5) The *Langaha* of Madagascar, Lacép. I, xxii, a Serpent only known by the figure of Brugière.

BUNGARUS,(1) Daud. partim.—PSEUDOBOA, Oppel.

Subventral and subcaudal plates, simple, as in Boa, Crotalus, &c.; head, short, and covered with large plates; occiput but slightly enlarged. Their most distinguishing character is a longitudinal range of scales on the back, which is strongly carinate, broader than the lateral ones, as in Dipsas. They are all from India, where they are termed *Rock Snakes*. One species attains a length of seven or eight feet.(2)

HYDRUS, Schn., partim.(3)—*Hydrophis and Pelamis*, Daud.

Posterior part of the body and tail strongly compressed, and much raised vertically; a circumstance, which, by enabling them to swim, renders them aquatic. They are very common in certain latitudes of the Indian Ocean. On account of their (nearly all) small scales, Linnæus classed such of them as he knew with the Anguines. Daudin has subdivided them as follows:

HYDROPHIS.(4)

A range of scales on the belly somewhat larger than the others, as in Tortrix; head small, not inflated, obtuse, and furnished with large plates. Several species have been found in the salt water canals of Bengal and others in the Indian Ocean.(5)

PELAMIS.

Large plates on the head, but the occiput inflated on account of the length of the pedicles of the lower jaw, which is extremely dilatable; all the scales on the body are equal, small, and arranged close to each other in hexagons.

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(1) *Bungarus*, a barbarous term drawn from that of *Bungarum-pamma*, the name by which the largest species is known in Bengal.

(2) The *Bongare à anneaux*, Daud., V, lxv, *Boa fasciata*, Schn., copied from Russel, III.—Add the *Bong. bleu*, *Boa lineata*, Sh. Russ., I.

(3) *Hydrus*, the Greek name of an aquatic Serpent, perhaps of our common Coluber; but the *Hydrus marinus* of Ælian is precisely of this genus.

(4) *Hydrophis*, Water Serpent.

(5) See the Hydrophis of Russel, Serp. Corom. pl. xliv, and part II, pl. vi—x. Add the *H. curtus*, Sh., the *H. spiralis*, Id. pl. 125;—the *Leyoselasme* and the *Disteyre*, Lacép., An. Mus. IV, also belong to the subgenus Hydrophis; I even think the latter is the *Hydrus major*, Sh. pl. 124. They also are Serpents of the Indian Ocean, venomous and possessed of several maxillary teeth.

N.B. I cannot agree with M. Fitzinger as to the harmlessness of the *Pelamides* and the *Disteyres*; on the contrary, I have fully ascertained their poison gland and fangs to be organized like those of a Hydra or a Bungarus. As to the *Aispysure*, Lacép. An. Mus. IV, I have not been able to procure it.

The species most known, *Anguis platurus*, L.; *Hydrus bicolor*, Schn.; Seb. II, lxxvii, 2; Russel, xli, is black above, yellow beneath. Although excessively venomous, it is eaten at Otaheite.

To these two subgenera I have added,

CHERSYDRUS, Cuv.(1)

The whole body as well as the head covered with small scales. Such is

Acrochordus fasciatus, Shaw; the *Oular-limpé*; Rept. pl. cxxx. A very venomous serpent, found on the bottom of rivers in Java.(2)

FAMILY III.

NUDA.

Our third and last family of the Ophidians, that of the Naked Serpents, consists of but one very singular genus, which several naturalists have thought fit to refer to the Batrachians, although we are ignorant as to the fact of its undergoing any metamorphosis. It is the

CÆCILIA, Lin.(3)

So called because its eyes, excessively small, are nearly hidden beneath the skin, and sometimes are wanting. The skin is smooth, viscous and furrowed by annular plaits or wrinkles; it is apparently naked, but on dissection we find in its thickness, perfectly formed though delicate scales, regularly arranged in several transverse rows between the folds of the skin.(4) The head is depressed; the anus round and nearly at the end of the body; the ribs much too short to surround the trunk: the articulation of the bodies of their vertebræ is effected by hollow conical facets filled with a gelatinous cartilage, as in Fishes and in some of the last of the Batrachians;

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(1) Χερσυδρος, the Greek name of the *Col. natrix*.

(2) The *Hydrus granulatus*, Schn. must be closely allied to it.

N.B. The *H. caspius*, *enhydris*, *rhynchops*, *piscator* and *palustris*, Schn. are mere common Vipers and Colubers. His *Hydrus colubrinus* is the Banded Platurus.

(3) *Cæcilia*, from τυφλωψ, is the Latin name of the Slow-worm (Orvet), which in several parts of Europe is still called *blind*, although it has very fine eyes.

(4) A fact I have ascertained in the *C. glutinosa*, the *White-bellied Cæcilia*, &c.

the cranium is united to the first vertebra by two tubercles, as is also the case in the Batrachians. The maxillary bones cover the orbit, which resembles a very small hole, and those of the temples the temporal depression, so that the head above presents one continuous bony buckler; the hyoid bone, composed of three pairs of arches, might induce us to suppose that at an early period it is furnished with branchiæ. The maxillary and palatine teeth are arranged on two concentric lines, as in Proteus; but they are frequently sharp, and curved backwards, like those of Serpents, properly so styled. The nostrils open behind the palate, and as the tympanal bone is fixed along with those that compose the cranial shield, there is no movable pedicle to the lower jaw.

The auricle of the heart is not sufficiently divided in these animals to induce us to consider it as double, but their second lung is as small as in other serpents; the liver is divided into a great number of transverse lamellæ. Vegetable matters, earth and sand are found in their intestines. The only small bone contained in the ear is a little plate on the fenestra ovalis, as in the Salamanders.

Some of them have an obtuse muzzle, relaxed skin, deep wrinkles, and two small cilia near the nostrils. Such is

Cæcilia annulata, Spix, xxvii, 1. Blackish, with eighty odd plicæ marked with white circles; teeth conical. Found in Brazil, where it lives in marshes, several feet beneath the surface.

C. tentaculata, L.; Amen. Acad. I, xvii, 1. One hundred and thirty odd plicæ, every other pair of which, particularly near the tail, does not completely encircle the body. It is black, marbled with white on the belly.(1)

Others have a much greater number of plicæ, or rather of close, transverse striæ.

Cæc. glutinosa, L.; Seb. XXV, 2; and Mus. Ad. Fred. IV, 1, is of that number, having three hundred and fifty plicæ, which unite beneath at an acute angle. It is blackish, with a longitudinal yellowish band along each flank. Found in Ceylon.(2)

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(1) This Cæcilia is not more tentaculated than others of its subdivision. Add, *C. albiventris*, Daud. VII, xcii, 1; if it is not the same as the *tentaculata*;—*C. interrupta*, Cuv. in which the white lines of the rings do not correspond with each other beneath;—*C. rostrata*, Cuv. with a more pointed muzzle, and no white edges to the rings. It is hard to say why Spix attributes upwards of two hundred plicæ to his *annulata*; his figure shows but about eighty.

(2) It is certainly from Ceylon, although Daudin places its habitat in America; as we have received it from the former country through the politeness of M. Leschenault; a closely allied species, it is true, inhabits the latter—*Cæc. bivittata*, Cuv.

There are some in which the plicæ are almost effaced; their body is very long and slender, and their muzzle salient. One species is completely blind; the *Cæc. lumbricoides*, Daud. VIII, xcii, 2; it is blackish; two feet in length, and about the thickness of a goose-quill.(1)

ORDER IV.

BATRACHIA.(2)

The Batrachians have a heart composed of but one auricle and one ventricle. They all have two equal lungs, to which at first are added branchiæ, that have some affinity with those of Fishes, and which have cartilaginous arches on each side of the neck attached to the hyoid bone. Most of them lose these branchiæ, and the apparatus which supports them, when they attain a state of maturity. Three genera only, Siren, Proteus, and Menobranchus, retain them for life.

As long as these branchiæ remain, the aorta is divided at its origin into as many branches on each side as there are branchiæ. The branchial blood is brought back by veins which unite near the back in one arterial trunk, as in Fishes. It is from this trunk, or immediately from the veins which form it, that arise most of the arteries which nourish the body, and even those which conduct the blood to be oxygenated in the lungs.

In those species, however, which lose their branchiæ, the attendant arteries are obliterated, with the exception of two, which unite in a dorsal artery, giving, each, a small branch to the lungs. It is the circulation of a Fish metamorphosed into that of a Reptile. Batrachians have neither scales nor shell; a naked skin invests their body,(1) and, one genus excepted, they have no nails.

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(1) Linnæus mentions it, Mus. Ad. Fred., V, 2, but confounds it with the *tentaculata.*

We have the skeleton of a Cæcilia more than six feet long, and having two hundred and twenty-five vertebræ, but of whose external characters we are ignorant.

(2) From βάτραχος (Frog), animals analogous to Frogs.

The envelope of the ova is membranous, and, in many species, they are only fecundated at the moment of their expulsion. These eggs become greatly enlarged in the water. The young do not only differ from the adult in the presence of the branchiæ; their feet are developed by degrees, and in several species there are a beak and tail, which they subsequently lose, and intestines of a different form.

Some species are viviparous.

RANA, Lin.

Frogs have four legs in their perfect state, but no tail. Their head is flat, muzzle rounded, and the opening of their jaws large; the tongue, in most of them, is soft, and not attached to the bottom of the gullet, but to the edges of the jaw, and folds inwards. There are but four toes to the anterior feet; the hind ones frequently exhibit the rudiment of a sixth.

There are no ribs to their skeleton, and a prominent cartilaginous plate supplies the place of a tympanum, and renders the ear visible externally. The eye is furnished with two fleshy lids, and a third, which is transparent and horizontal, concealed under the lower one.

Inspiration is solely effected by the muscles of the throat, which by dilating, receive air from the nostrils, and by contracting while the nostrils are closed by the tongue, compel that air to enter the lungs. Expiration, on the contrary, is produced by the muscles of the lower part of the abdomen: thus if we open the belly of one of these animals while alive, the lungs dilate without being able to contract, and if we force another to keep its mouth open, asphyxia is the consequence, as it is no longer able to renew the air in its lungs.

The embraces of the male are long continued. His thumbs are furnished with a spongy enlargement which increases during the nuptial season and assists in attaching him to the female. He fecundates the ovum at the moment of its expulsion. The little animal that is produced from it, called a Tadpole, is at first furnished with a long fleshy tail, and a small horny beak, having no other apparent limbs than little fringes on the sides of the neck. In a few days these disappear, and Swammerdam assures us that this is owing to their withdrawing under the skin, where they form the branchiæ. These latter are numerous small tufts attached to four cartilaginous arches, placed on each side of the neck, adhering to the hyoid bone, enveloped in a membranous tunic and covered by the general skin. The water which enters the mouth, passing through the intervals of the cartilaginous arches, makes its exit, sometimes by two openings, and at others by one, situated either in the middle or left side of the external skin, according to the species. The hind feet of the Tadpole are very gradually and visibly developed; the fore feet are also developed, but under the skin, through which they subsequently penetrate. The tail is gradually absorbed. The beak falls and discloses the true jaws, which at first were soft and concealed beneath the skin; and the branchiæ are annihilated, leaving to the lungs alone the function of respiration in which they participated. The eyes which at first could only be discerned through a transparent spot in the skin of the Tadpole, are now visible with their three lids. The intestines, which, in the beginning, were long, slender, and spirally arranged, become shortened, and acquire the enlargements requisite for the stomach and colon, for the Tadpole feeds solely on aquatic plants, and the adult animal upon insects and other animal matters. Tadpoles reproduce their limbs almost like Salamanders.

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(1) M. Schneider has proved that the *Scaly Frog* of Walbaum only appeared so from accident, a few scales from some Lizards that were kept in the same jar having adhered to its back. Schn. Hist., Amphib. Fasc. I, p. 168.

The period at which each of these changes takes place varies with the species.

In cold and temperate climates, the perfect animal passes the winter under ground, or in the the mud under water, without eating or breathing, though if we prevent it from respiring during the summer for a few minutes by keeping its mouth open, it dies.

RANA, Laur.

Frogs, properly so called, have a long tapering body; the hind feet extremely long, strong, and more or less perfectly palmated; the skin smooth; upper jaw furnished all round with a row of small fine teeth and an interrupted transverse range of them in the middle of the palate. On each side of the head of the male and below the ear, is a thin membrane which becomes distended with air when he croaks. These animals leap and swim well.

R. esculenta, L.; Rœsel. Ran. pl. xiii, xiv. (The Green Frog.) A fine green spotted with black; three yellow streaks on the back; belly yellowish. A common species in Europe in all stagnant waters, and very annoying by its ceaseless nocturnal clamour. Its flesh is a wholesome and agreeable food. The female excludes her ova in bundles in the marshes, &c.

R. temporaria, L.; Rœsel. Ran. pl. i, ii, iii. (The Common Frog.) Reddish-brown spotted with black; a black band commencing at the eye and reaching across the ear. This species is the first that appears in the spring; it visits the land less frequently than the preceding, and is not so noisy. Its tadpole is not so large at the epoch of its metamorphosis.

R. cultripes, Cuv. Every where sprinkled with black spots; feet simply palmate; particularly remarkable for a horny and trenchant scale which invests the vestige of the sixth toe. From the south of France.

Among the Frogs foreign to Europe we may remark,

R. paradoxa, L.; Seb. I, lxxviii; Merrian, Surin. LXXI; Daud., Gren. XXII, XXIII (The Jakie), whose tadpole acquires a size previous to its complete metamorphosis greater than that of any other species of the genus. The loss of an enormous tail and the envelopes of the body, causes the adult animal to be smaller than the tadpole, a circumstance which induced the earlier observers to believe that it was the Frog which was metamorphosed into a tadpole, or, as they expressed it, into a Fish. This error is now completely refuted.

The Jakie is greenish spotted with brown, and is particularly distinguished by irregular brown lines along its thighs and legs. From Guiana.

There are several other Frogs foreign to Europe, some of which are very large and not well determined.(1) Such is

R. pipiens, L.; Catesb. II, lxxii. (The Bull-Frog.) Green above, yellowish beneath, spotted and marbled with black.(2)

The hind toes of certain species are almost without a web, but still very long.(3)

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(1) A closer examination and a review of the numerous Batrachians received at the Museum within a few years, compel me to recal my approbation of the work of Daudin. It is imperfect, and half the figures are taken from altered specimens, and can never serve as guides to the precise determination of species. His *Hylæ*, however, must be excepted; they are much better than his Frogs and Toads.

(2) I am convinced that several species are confounded under this name in the United States, species which are similar as to size and colour, but which, among other characters, differ in the relative size of the tympanum. The one in which it is largest is the *mugiens* of Merrem, but we cannot depend upon his synonymes. The fig. of Daud. XVIII, with a yellow stripe along the back, is a species from India. Add: *R. palmipes*, Spix, V, 1;—*R. tigrina*, Daud. XX;—*R. virginica*, Gmel. Seb., I, lxxv, 4, or *halecina*, Daud., or *pipiens*, Merr., Catesb. LXX;—*R. clamitans*, Daud., XVI.

N.B. This last species is the young of the *Bull-Frog*. *Am. Ed.*

(3) *Rana ocellata*, L. Seb. I, lxxv, 1, Lacep. I, xxxviii, Daud. XIX;—*R. gigas*,

CERATOPHRIS, Boié.

Frogs with a broad head; skin granulate, either wholly or in part; a membranous prominence to each eye-lid resembling a horn.(1) In some the tympanum is concealed under the skin.(2) They are all from South America.

Southern Africa produces Batrachians resembling Frogs in their teeth and smooth skin; their toes are pointed, the hind ones broadly palmated, and the extremities of the three internal ones enveloped in a black, conical, horny nail; their head is small and their mouth moderate; the tongue, attached to the lower part of the gullet, is oblong, fleshy and very large; their tympanum is not visible. These numerous characters have induced us to form a genus for them by the name of DACTYLETHRA.(3)

HYLA, Laur.—CALAMITA, Schn. and Merr.

Tree-Frogs only differ from Frogs in the extremities of their toes, each of which is expanded into a rounded viscous pellet, that enables them to adhere to the surface of bodies and to climb trees, where in fact they remain all summer living upon insects. They spawn, however, in water, and enter the mud in winter like other Frogs. There is a pouch under the throat of the male, which dilates whenever he cries.

Rana arborea, L.; Rœs., Ran. pl. ix, x, xi. (The Common Tree-Frog.) Green above, pale beneath; a black and yellow

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Spix, I;—*R. pachypus*, Id. II;—*R. coriacea*, Id. V, 2;—*R. sibilatrix*, Pr. Max.; —*R. maculata*, Daud., XVII, 2;—*R. rubella*, Ib. I;—*R. typhonia*, Ib. 4, which is not, as Merrem thinks, the *virginica*, Gm.;—*R. punctata*, Ib. XVI, 1;—*R. mystacea*, Spix, III, 2—3;—*R. militaris* and *R. pygmæa*, Id. VI;—*R. labyrinthica*, Id. VII. [Add *R. fontanalis*, L. C.;—*R. palustris*, Id.;—*R. sylvatica*, Id.;—*R. pumila*, Id.;—*R. gryllus*, Id.;—*R. nigrita*, Id., Ann. of the Lyceum. *Am. Ed.*]

(1) *Ceratophris varius*, B, or *Rana cornuta*, Seb. I, lxxii, 1—2; Tiles., Mag. de Berl., 1809, 2d Trim. pl. iii, and Krusenst. Voy. pl. vi, or *Ceratophris dorsata*, Pr. Max. 2me livr.;—*Cerat. Spixii*, Cuv. or *R. megastoma*, Spix, IV, 1;—*R. scutata*, Ib. 2;—*Cerat. Daudini*, Cuv., Daud. xxxviii;—*Cerat. clypeata*, Cuv.

(2) *Ceratophris granosa*, Cuv., one of those Frogs with a concealed tympanum, of which Gravenhorst has made his genus STOMBUS; but they have teeth like the others, and should not be approximated to the Toads, where Fitzinger has placed them.

(3) From δακτυλῆθρα (thimble): such is the form of their nails. The *Crapaud lisse*, Daud. pl. xxx, f. 1, is a bad figure, the hind feet being altogether wrong; it forms the *Pipa lævis*, Merr. The *Pipa bufonia*, Merr. or pretended male Pipa, Enl. No. 21, f. 2, is also the same species, but drawn without nails. These species of Merrem constitute the ENGYSTOMA of Fitzinger, but the true Engystomæ or the *Breviceps*, Merr. have neither teeth nor nails.

line along each side of the body. They are adult in four years, and couple towards the end of April. The tadpole completes its metamorphosis in the month of August.

The Hylæ foreign to Europe are numerous, and some of them beautiful. One of the largest and handsomest is

H. bicolor, Daud., VIII; and Spix, XIII. Sky-blue above, rose-colour beneath. From South America. A still larger species,

H. palmata, Daud. XX; *Rana maxima*, L., is transversely and irregularly striped with red and fawn-colour. From North America.(1)

On account of the singular property attributed to it we may mention the *Rana tinctoria*, L. It is said that if some of the feathers of a Parrot be plucked out and the skin be imbued with the blood of this animal, it causes a reproduction of red or yellow feathers, and forms that peculiar appearance which is termed by the French *tapiré*. We are assured it is a brown species, with two whitish bands transversely united in two places (Daud. pl. viii); the toes of the hind feet are almost free.(2)

Bufo, Laur.

Toads have a thick, bulky body covered with warts or papillæ; a thick lump behind the ears pierced with pores, from which issues a milky and fetid humour; no teeth; the hind feet but slightly elongated. They leap badly, and generally avoid the water. They are hideous and disgusting animals, whose bite, saliva, urine, &c., are considered, though erroneously, as poisonous.

Rana bufo, L.; Rœs. Ran. XX. (The Common Toad.) Reddish-grey, or grey-brown; sometimes olive or blackish; the back covered with rounded tubercles as large as lentils; smaller and more closely set tubercles on the belly; the hind feet semi-palmate. It remains in dark places, and passes the winter in a hole which it excavates. It couples in the water in March and April; when this takes place on shore, the female drags herself to some ditch, &c., carrying the male with her: she produces innumerable small ova, united by a transparent kind of jelly in two strings, that are often twenty or thirty feet long, in the extraction of which the male assists with his hind feet. The Tadpole is blackish, and is the smallest of the European species, at the period when it acquires legs and loses its tail. The Common Toad lives upwards of fifteen years, and is adult at four. Its cry has some resemblance to the barking of a dog.

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(1) Add, of palmated species, *Hyl. venulosa*, Daud., XIX, or *Cal. boans*, Merr. Seb., I, lxxii;—*H. tibicen*, Seb. Ib. 1, 2, 3;—*H. marmorata*, Seb. I, lxxi, 4, 5, Daud. XVIII;—*H. lateralis*, Catesb. II, lxxi, Daud., II;—*H. bilineata*, Daud. III;—*H. verrucosa*;—*H. oculata*;—*H. frontalis*, Id. and in Spix; *Hyl. bufonia*, XII;—*H. geografica*, XI, 1;—*H. albomarginata*, VIII, 2;—*H. papillaris*, 2;—*H. pardalis*, 3;—*H. cinerascens*, 4;—*H. affinis*, VII, 3.

(2) Add of species whose hind toes are but slightly palmate, *H. femoralis*, Daud. IV;—*H. squirella*, Daud. V;—*H. trivittata*, &c. Spix, IX;—*H. abbreviata*, Id. XI, 4. [Add *H. delitescens*, L. C. and *H. versicolor*, Id. loc. cit., *Am. Ed.*]

The *Hyla cyanea*, Daud. of New Holland, according to White, p. 248, has but four toes behind, and M. Fitzinger, who appears to have seen it, has consequently formed it into his genus Calamita. We have one from the same country, and exactly similar, which certainly has five.

R. bufo calamita, Gm.; Rœs. XXIV; Daud. XXVII, 1. Olive colour; tubercles, as in the preceding; but not such large swellings behind the ears; a yellow longitudinal line on the spine, and a dentated reddish one on the flank: no membrane to the hind feet. It diffuses a disagreeable odour, like that of gun-powder, lives on land, and never leaps, but runs tolerably fast. It also climbs up walls, to seek a shelter in their crevices, and for that purpose has two little osseous tubercles under the palm of the hands. It never visits the water except to couple, in the month of June; the female lays two strings of eggs, like the Common Toad; the voice of the male, which has also a sac under the throat, resembles that of the Tree Frog.

Bufo fuscus, Laurent.; *Rana bombina*, γ, Gm.; Rœs. XVII, XVIII. (The Natter Jack.) Light brown marbled with dark brown or blackish; tubercles on the back but few, and the size of lentils; the belly smooth; toes of the hind feet elongated, and completely palmate; it leaps well, prefers the vicinity of water, and diffuses a strong odour of garlic when disturbed. The ova form but one string, thicker however than both those of the Common Toad. The tadpole is longer in coming to maturity than any other French species; and, when very large, is still found with its tail, and the fore-feet, not developed—when it does complete its metamorphosis, it actually seems to shrink. It is eaten in some places as if it were a fish.

Ran. variabilis, Gm.; *Crapaud vert*, Lacép.; Pall. Spicil. VII, vi, 34; Daud. xxviii, 2. Almost smooth; whitish, with deep green spots; remarkable for the changes in the hue of the skin, according to the light in which it is placed, or as it wakes or sleeps.

Bufo obstreticus, Laur.; *Le Crap. accoucheur*, Daud. pl. xxxii, f. 1. Small; grey above; whitish beneath; blackish points on the back, and whitish ones on the sides. The male assists his female in the expulsion of the eggs, which are large, and fastens them on his thighs, in bundles, by means of some glutinous threads. He carries them about with him until the eyes of the tadpoles they contain can be distinguished through their envelope, and, in fact, until the time when they are about to be hatched; he then seeks some stagnant water, in which he deposits them. The eggs immediately split, and the tadpoles swim out. It is very small, and is carnivorous. Very common in stony places near Paris.(1)

Sicily produces a toad three or four times larger than those of France, that is brown, with flat and irregular tubercles. It is generally found in the tuft of a palm. We will call it *Bufo palmarum.*

The Toads, foreign to Europe, have hitherto been badly determined; several are remarkable for their size.

Rana marina, Gm.; *Le Crapaud agua;* Daud. XXVII; Spix, XV. Brown, varied with dark brown; unequal and slightly salient tubercles; the triangular parotids more than an inch wide in individuals, which are from ten to twelve inches long, exclusive of the feet. Found in the marshy districts of South America.(2)

Several subgenera have been lately separated from that of the Toads; thus the

BOMBINATOR, Merr.

Only differs from the others in the tympanum being concealed under the skin; such in France is the

Rana bombina, Gm.; *Crapaud à ventre jaune;* Rœs. XXII; Daud. XXVI. The smallest and most aquatic of all the Toads of that country. It is greyish or brown above; a black-blue with orange spots beneath; the hind feet completely palmate and almost as long as those of Frogs, so that it leaps nearly as well. It lives in marshes and couples in June; the eggs are produced in little balls, and are larger than those of the preceding species. The(3)

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(1) It is impossible to say why Merrem placed the *obstetricus* among his Bombinatores—its tympanum is very visible.

(2) Add, *Bufo maculiventris*, Spix, XV, should it prove to differ from the *agua;*—*B. ictericus*, Id. XVI, 1;—*B. lazarus*, Id. xvii, 1;—*B. stellatus*, Id. XVIII, 1;—*B. scaber*, Daud., XXXIV, which is not the same as the *B. scaber* of Spix, X, 1;—*B bengalensis*, Id. xxxv, 1;—*B. musicus*, Id. XXXIII, 2;—*B. cinctus*, Pr. Max. fasc. 3: the *B. agua*, Id. fasc. 7, does not appear to be the same as that of Spix.

[Add *B. americanus*, L. C. *Am. Ed.*]

(3) Add *Bufo ventricosus*, Daud., XXX, 2, the turgidity of which is exaggerated.

Rhinellus, Fitzing.—Oxyrynchus, Spix,

Has a muzzle pointed anteriorly.(1) We should approximate to it the

Otilophis, Cuv.

Where the muzzle is also angular, and where there is a crest on each side of the head which extends over the parotid. The *Crapaud perlé*, (*Ran. margaritifera*, Gm.,) Daud. XXXIII, is its type.

Breviceps, Merr.—Engystoma, Fitzing., partim.

Toads without a visible tympanum or parotid, in which the body is oval, head and mouth very small, and the feet but slightly palmated.(2)

A more essential difference is that which has separated the Pipæ of Laurenti from all the great genus Rana.

Pipa, Laur.

This subdivision is distinguished by a horizontally flattened body; a broad and triangular head; by the absence of a tongue; by a tympanum concealed under the skin; by small eyes placed near the edge of the upper jaw; by anterior toes, each of which is divided at the extremity into four small points; and finally by the enormous larynx of the male, formed like a triangular osseous box, inside of which are two movable bones, which can be made to close the entrance to the bronchiæ.(3)

The species formerly known, *Rana pipa*, L.; Seb. I, lxxvii; Daud., xxxi, xxxii, is found at Cayenne and Surinam in dark places about the houses. Its back is granulated, with three longitudinal ranges of larger granules. When the ova are expelled, the male places them on the back of the female and there fecundates them; the latter then proceeds to the water, the skin of her back swells and forms cells in which the eggs are hatched. Thė life of the tadpole is passed in the water, and it does not leave it until it has lost its tail, and acquired feet. It is at this time also that the mother returns to land.

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(1) *Bufo proboscideus*, Spix, XXI, 4;—the neighbouring species figured on the same plate, *B. semilineatus*, *B. granulosus*, *B. acutirostris*, and those of pl. xiv, *naricus* and *nasutus*, connect this subgenus too closely with the common Toads to be easily retained.

(2) *Engystoma dorsatum*, Nob., or *Bufo gibbosus*, Auct., Seb., II, xxxvii, No. 3, Daud. XXIX, 2;—*Eng. marmoratum*;—*Eng. granosum*, Cuv., new species, one from India, the other from the Cape. The mouth of the *Eng. surinamense*, Daud., XXXIII, 2, is already larger, as well as in the *Bufo globulosus* and *albifrons*, Spix, XIX. N.B. The *Eng. ovalis*, Fitz. is a *Dactylethra*; his *Eng. ventricosa*, Daud. XXX, 2, is a *Bombinator*.

N.B. The *Bufo ephippium*, Spix, XX, 2, of which Fitzinger makes his genus Brachycephalus, on account of there being but three toes to all the feet, may be a young specimen badly preserved or incorrectly figured.

(3) Described by Schneider under the name of *Cista sternalis*.

Spix figures one of them pl. xxii, at least a closely allied species,—*Pipa curururu*, Spix,—from the bottom of the Brazilian lakes, and asserts that the female does not carry her young; he does not inform us, however, that he observed her during the whole year.(1)

SALAMANDRA, Brogn.

Salamanders have an elongated body, four feet and a long tail, which gives them the general form of Lizards, with which Linnæus placed them: but they have all the characters of Batrachians.

Their head is flattened; the ear completely hidden under the muscles, without any tympanum, having nothing but a small cartilaginous plate on the fenestra ovalis; the two jaws furnished with numerous and small teeth; two longitudinal rows of similar teeth in the palate, but attached to bones analogous to the vomer; the tongue as in the Frogs; no third eye-lid; a skeleton with very small rudiments of ribs, but without a bony sternum; a pelvis suspended from the spine by ligaments; four toes before, and almost always five behind. In their adult state, respiration is performed as in Frogs and Tortoises. Their tadpoles at first breathe by means of branchiæ resembling tufts, three on each side of the neck, which are subsequently obliterated; they are suspended to cartilaginous arches, vestiges of which remain in the hyoid bone of the adult. A membranous operculum covers these openings, but the tufts are never enclosed by a tunic, and always float externally. The fore feet are developed before the hind ones; the toes appear successively in the first and the last.

SALAMANDRA, Laur.

The terrestrial Salamanders in a perfect state have a round tail, and inhabit the water only during their tadpole condition, which is but a short period, or when the female is ready to bring forth. The eggs are hatched in the oviduct.

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(1) There is a true Pipa in the Cabinet du Roi, from Rio Negro, which is entirely smooth, and with an unusually narrow head. It will be my *Pipal ævis*, very different from that of Merrem, which is a *Dactylethra*.

The terrestrial species of France have a gland analogous to that of the Toad, on each side of the occiput.

Salam. maculosa, Laur.; Lac. II, pl. xxx; *Lacert. salamandra*, L. Black, with large spots of a bright yellow; ranges of tubercles on the sides, from which, when agitated by fear, oozes a milky, bitter liquid, that has a strong odour and is poisonous to very weak animals. It is, perhaps, this circumstance which has given rise to the fable of the incombustibility of the Salamander. It lives in wet places and hides itself in holes, feeds on lumbrici, insects and earth, brings forth its young living, and deposits them in pools; at first they have branchiæ, and their tail is vertically compressed.(1)

A Salamander resembling the common one, but entirely black and immaculate, is found in the Alps, it is the *Sal. atra*, Laurent. pl. 1, f. 2.

Sal. perspicillata, Savi. Only four toes to all the feet; black above; yellow, spotted with black beneath: a yellow line across the eyes. A small species from the Apennines.(2)

North America, which produces many more Salamanders than Europe, has several that are terrestrial, with a round tail, but deficient in the glands on the occiput.(3)

Triton, Laur.

Aquatic Salamanders always retain the vertically compressed tail, and pass nearly the whole of their existence in the water. The experiments of Spallanzani on their astonishing power of reproduction, have rendered them celebrated. If a limb be amputated, another is reproduced in its stead with all its bones, muscles, vessels, &c. and this takes place several times in succession. Another not less singular faculty, discovered by Dufay, is the power they possess of remaining enclosed in ice for a considerable time without perishing.

Their eggs are fecundated by the seminal fluid diffused in the water, which enter the oviduct together; they are expelled in long chaplets; the young are not hatched until the fifteenth day, and retain their branchiæ for a longer or shorter time according to the species. Modern observers have recognized several of them in France, but as the colour of these animals changes according to the age, sex and season of the year, and as the crests and other ornaments of the males are only well developed in the spring, the species have not been determined with certainty. When winter surprises them with their branchiæ, they retain them till the following year, always increasing in size.(1)

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(1) See, Ad. Fred. Funck., *de Salam. terrest. vita, evolutione, formatione*, Berlin, fol. 1827.

(2) We have ascertained that the *Sal. à trois doigts*, Lacép. II, pl. 36, is merely a dried and somewhat mutilated specimen of the *Sal. perspicillata*;—Add, *S. Savi*, Gosse.

(3) *Sal. venenosa*, Daud., or *subviolacea*, Barton;—*Sal. fasciata*, Green;—*Sal. tigrina*, Id.;—*Sal. erythronota*, Id.;—*Sal. bilineata*, Id.:—*Sal. rubra*, Daud. VIII, pl. 91, f. 2;—*S. variolata*, Gilliam. Sc. Nat. Phil., I, pl. xviii, f. 1, and several new species. The *Sal. japonica*, Houtuin, Bechst. trans. of Lacép., II, pl. 18, f. 1, is closely allied to the *erythronota*.

S. marmorata, Latr.; *Triton Gesneri*, Laur. Skin, granulated; pale green above, with large irregular brown spots; brown, dotted with white beneath; a red line along the back, which, in the male, is slightly crested and marked with black spots. But slightly aquatic.

S. alpestris; Salam. à flancs tachetés, Bechst. tr. Lac. pl. xx. Skin granulated; slate coloured and brown above; orange or red belly; a band of numerous small black spots on each flank.

S. cristata, Latr. Skin, granulated; brown above, with round blackish spots; orange beneath, similarly spotted; sides dotted with white; crest of the male elevated, acutely denticulate, and in the nuptial season edged with violet.

S. punctata, Latr. Skin, smooth; a light brown above; pale or red beneath; round black spots every where; black streaks on the head; crest of the male festooned; the toes somewhat widened, but not palmate.

S. palmata, Latr. Back brown; top of the head vermiculated with brown and blackish; paler on the flanks, with round blackish spots; belly immaculate. The male has three small dorsal crests; toes dilated and united by membranes, and the tail terminated by a small filament.(2)

Several aquatic Salamanders are also found in North America.(3)

Skeletons of a Salamander three feet in length have been discovered among the schist of Œningen. One of them is the pretended *Fossil Man* of Scheucher.

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(1) It was from an individual which had thus retained its branchiæ that Laurenti made his *Proteus tritonius*.

(2) The characters of the European species appear to me to be such as are most conformable to nature; to add the synonymes of authors would be a difficult task, so little do their figures and descriptions agree with the animals before me.

(3) *Sal. symmetrica*, Harl. which appears to me previously represented in Bechstein's Lacép. II, pl. xviii, f. 2, under the name of *Sal. punctata;* and several species whose descriptions I could not recognize, and which richly merit a monograph, accompanied by good figures.

Immediately after the Salamanders come several very similar animals, some of which are considered as having been always destitute of branchiæ, that is, they probably lose them at as early a period as our terrestrial Salamanders; the others, on the contrary, retain them for life, a circumstance, however, which does not prevent their having lungs like the Batrachians, so that they may be considered as the only vertebrate animals which are truly amphibious.(1)

The former (those in which no branchiæ are visible) constitute two genera.

MENOPOMA, Harlan.(2)

Form of a Salamander; eyes apparent, the feet well developed, and an orifice on each side of the neck. Besides the range of small maxillary teeth, there is a parallel row of them on the front of the palate. Such is the reptile termed

Sal. gigantea, Barton; *Great Salamander of North America;* Ann. of the New York Lyc. I, pl. 17. (The Hellbender.) From fifteen to eighteen inches long; a blackish blue; inhabits the lakes and the rivers of the interior.

AMPHIUMA, Garden.

An orifice on each side of the neck, but the body excessively elongated; the legs and feet, on the contrary, but very slightly developed; the palatine teeth form two longitudinal ranges.

In one species there are but three toes to each foot; *Amph. tridactylum*, Cuv.; and in another, *Amph. means*, Gard. and Harl. but two—Mem. du Mus. XIV, pl. 1.(3)

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(1) The simultaneous existence and action of the branchial tufts and of the lungs in these animals, are as incontestable as any one of the most indubitable facts presented to us in natural history; there are now before me the lungs of a Siren three feet long, in which the vascular apparatus is as well developed and as complex as in any reptile whatever, notwithstanding which, the branchiæ of this same animal were as complete as those of others.

(2) Dr Harlan first called them ABRANCHUS; Leukard and Fitzinger call them CRYPTOBRANCHUS, and others PROTONOPSIS.

(3) The *Amphiuma* was known to Linnæus, but at too late a period to allow him to insert it in any of the editions of his system which appeared during his life. It has been described since by Dr Mitchell, under the name of *Chrysodonta larvæformis*, and by Dr Harlan under that of *Amphiuma.* I have described the *Amph. triductylum* of Louisiana, which attains the length of three feet. See Mém. du Mus. tome XIV, 1. I suspect this is the species spoken of by Barton in his letter upon the Siren, as a Siren with four feet.

Among those which always retain their branchiæ, the

AXOLOTUS

Is in every respect similar to the larva of an aquatic Salamander, having four toes before, five behind, three long tufted branchiæ, &c. The maxillary teeth are like velvet, and those on the vomer in two bands. Such is the

Siren pisciformis, Shaw; the *Axolotl* of the Mexicans; Gen. Zool. vol. III, part ii, pl. 140; Humb. Zool. Obs. I, pl. 12. From eight to ten inches long; grey, spotted with black. It inhabits the lake that surrounds Mexico.(1)

MENOBRANCHUS, Harl.—*Necturus*, Raffin.

But four toes to all the feet; a range of teeth in the intermaxillaries, and another, parallel, but more extended, in the maxillaries.

The species most known, *Menobranchus lateralis*, Harl.; *Triton lateralis*, Say; Ann. of the New York Lyc. I, pl. xvi, inhabits the great lakes of North America, attaining, as it is said, the length of two and three feet. It was first obtained from Lake Champlain.

PROTEUS, Laurent.—HYPOCHTON, Merr.

But three toes before and only two behind.

Hitherto but a single species has been discovered, *Proteus anguinus*, Laur. pl. IV, f. 3; Daud., VIII, xcix, 1; *Siren anguina*, Schn. More than a foot long, about the thickness of a finger, with a vertically compressed tail and four small legs. Its muzzle is elongated and depressed; its two jaws furnished with teeth; its tongue but slightly movable and free before; its eyes extremely small and hidden by the skin, like those of the Zemni (*Mus typhus*, Pall.); the ear covered by the muscles as in the Salamanders, and the skin smooth and whitish. It is only found in some subterraneous streams, by which certain lakes in Carniola communicate with each other. The skeleton resembles that of the Salamander, except that it has many more vertebræ, and fewer rudiments of ribs; the bony head, however, differs altogether in its general conformation.

Finally, there are some which are possessed of fore feet only, the hind ones being entirely deficient. They are

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(1) It is with some hesitation that I place the Axolotl among the genera with permanent branchiæ, but so many witnesses assure us that it does not lose them that I am compelled to do so.

SIREN, Lin.

Sirens are elongated animals, almost anguilliform, with three branchial tufts; they have no hind feet, nor is there even a vestige of a pelvis. Their head is depressed, the opening of their mouth small, their muzzle obtuse, eye very small and ear concealed; the lower jaw is armed with teeth all round, and there are none in the upper one, but there are several rows of them adhering to two plates fixed under each side of the palate.(1)

S. lacertina, L. Blackish, and attains the length of three feet; four toes to each foot; tail compressed into an obtuse fin. It inhabits the marshes of Carolina, the rice swamps particularly, where it lives in the mud, occasionally going on shore or into the water. It feeds on lumbrici, insects, &c.(2) There are two much smaller species,

S. intermedia, Le Conte, Ann. New York Lyc., II, Dec. 1826, pl. 1. Blackish; four toes like the large one, but the branchial tufts are less fringed; its length does not exceed one foot.

S. striata, Le Conte, Ib. I, pl. 4. Blackish; two longitudinal yellow streaks on each side; only three toes; the branchial tufts but slightly fringed; length nine inches.(3)

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(1) It is in vain that some authors have recently endeavoured to revive the ancient idea, that the Siren is the *tadpole* of the Salamander. We possess specimens of them much larger than any known Salamander, whose bones have acquired their perfect hardness without the smallest vestige of hind feet; their osteology also differs widely from that of the Salamanders; they have more (90), and differently shaped vertebræ and fewer ribs (eight pairs); the conformation of the head, and the connexion of the bones which compose it, are altogether different. See Oss. foss. tome V, part II.

(2) Barton denies that it feeds on Serpents, and that its voice resembles that of a young Duck, as affirmed by Garden. Barton, "Some account of S. Lacert., &c."

(3) The branchiæ of these two species have been considered as taking no part in the process of respiration, in consequence of which M. Gray has formed a genus for them, which he calls PSEUDOBRANCHUS; it is easy, however, on their inferior surface, to see folds and a vascular apparatus whose use is, to us, very plain; besides this, the observations of Major Le Conte demonstrate the fact, that these Sirens, like the Lacertinidæ, are perfect animals.

CLASS IV.

PISCES.

The class of Fishes is composed of oviparous vertebrata with a double circulation, but in which respiration is altogether effected through the medium of water. For this purpose, on each side of the neck, they have an apparatus called branchiæ, which consist of laminæ suspended on arches that are attached to the hyoid bone, each composed of numerous separate laminæ and covered with a tissue of innumerable blood-vessels. The water which the fish swallows, escapes between these laminæ through the branchial openings, and by means of the air it contains, acts upon the blood that is continually arriving in the branchiæ from the heart, which only represents the right auricle and ventricle of warm-blooded animals.

This blood, having received the benefit of respiration, is poured into an arterial trunk situated under the spine, which, exercising the functions of a left ventricle, distributes it to every part of the body, whence it returns to the heart by the veins.

The entire structure of the Fish is as evidently adapted for natation, as that of the Bird for flight. Suspended in a liquid of nearly the same specific gravity as its own body, there was no necessity for large wings to support it. In a great number of species, immediately under the spine there is a bladder filled with air, which, by compression or dilatation, varies the specific gravity of the fish and assists it to rise or descend. Progression is effected by the motions of the tail, which, by striking the water alternately right and left, forces them forward; the branchiæ, by impelling the water backwards, may also contribute to this effect. The limbs being thus of but little use, are greatly reduced; the parts analogous to the bones of the arms and legs are extremely short, or even completely concealed; *rays*, more or less numerous, which support membranous fins, form a rude representation of the fingers and toes. The fins which correspond to the anterior extremities are termed *pectorals*, and those which answer to the posterior ones, *ventrals*. Other rays attached to particular bones placed on or between the extremities of the spinous apophyses support vertical fins on the back, under the tail, and at its extremity, which, by being raised or lowered, increase or diminish the surface which strikes against the water. The superior fins are called *dorsal*, the inferior *anal*, and that at the end of the tail *caudal*. The rays are of two kinds; some of them consist of a single bony piece, usually hard and pointed, sometimes flexible and elastic, divided longitudinally—these are called *spinous rays;* others are composed of a great number of small articulations, and are generally divided into branches at their extremity—they are the *soft*, *articulated*, or *branched rays*.

There is as much variety among Fishes, with respect to the number of limbs, as among Reptiles. Most generally there are four; some have but two, and in others they are totally wanting. The bone which is analogous to the scapula, is sometimes held among the muscles as in the higher animals, and at others is attached to the spine, but most commonly it is suspended on the cranium. The pelvis rarely adheres to the spine, and very frequently, instead of being behind the abdomen, is before it, and connected with the humeral apparatus.

The vertebræ of Fishes are united by concave surfaces filled with cartilage which most generally communicate by a canal excavated in the axis of the vertebræ. In most of them they have long spinous processes which maintain the vertical form of the body. The ribs are frequently soldered to the transverse processes.

The head varies more as to form than that of any other class, notwithstanding which it almost always consists of the same number of bones as is found in other oviparous animals.

The frontal bone is composed of six pieces; the parietal of three; the occipital of five; five pieces of the sphenoides and two of each temporal bone, remain, in the composition of the cranium.

Besides the usual parts of the brain which are arranged as in Reptiles one after the other, Fishes have knots or ganglions at the base of their olfactory nerves.

Their nostrils are simple cavities at the end of the muzzle almost always perforated by two holes, and regularly lined by a plaited pituitary membrane.

The cornea of their eye is very flat, and there is but little aqueous humour, but the crystalline is very hard and almost globular.

Their ear consists of a sac representing the vestibule, in which are suspended small bodies most commonly of a stony hardness, and of three membranous semi-circular canals, situated in the cavity of the cranium rather than in the substance of its parietes, the Chondropterigii excepted, in which they are entirely contained in them. The eustachian tube and tympanal bones are always deficient, and the Selachians alone have a fenestra ovalis which is level with the head.

The sense of taste in Fishes can have but little energy, as a great portion of the tongue is osseous, and frequently furnished with teeth and other hard parts.

The body in most of them is covered with scales, and none possess organs of prehension; the fleshy cirri of some may supply the imperfection of the other organs of touch.

In the greater number, the intermaxillary bone forms the edge of the upper jaw, having behind it the maxillary, termed the labial bone. A palatine arch, composed of the palatine bones, of the two pterygoid processes, the zygomatic process, the tympanum and squamous portion, forms, as in Birds and Serpents, a sort of anterior jaw, and furnishes, behind, an articulation for the lower jaw, which generally has two bones on each side; the number of these pieces, however, is reduced in the Chondropterygii.

Teeth are found in their intermaxillary, maxillary, lower jaw, vomer, bones of the palate, on the tongue, on the arches of the branchiæ, and even on bones behind these arches, attached like them to the hyoides, called pharyngeal bones.

The varieties of these combinations, as well as those of the form of the teeth placed at each point, are innumerable.

Besides the apparatus of the branchial arches, the hyoid bone is furnished on each side with rays which support the branchial membrane. A sort of lid composed of three bony pieces, the operculum, the suboperculum, and the interoperculum, unites with this membrane in closing the great opening of the gills; it is articulated with the tympanal bone, and plays on one called the preoperculum. In many of the Chondropterygii this apparatus is wanting.

The stomach and intestines differ in size, figure, thickness and circumvolutions, as greatly as in the other classes. The pancreas, except in the Chondropterygii, is replaced either by cæcums of a peculiar tissue situated round the pylorus, or by the tissue itself applied to the beginning of the intestine.

The kidneys are situated along the sides of the spine, but the bladder is above the rectum, and opens behind the anus and behind the orifice of generation; exactly the inverse of what we find in the Mammalia.

The testes are two enormous glands commonly termed *milts;* and the ovaries, two sacs about the same form and size, in whose internal folds are deposited the eggs. Some fishes copulate and are viviparous; the young fry are hatched in the ovary and issue through a very short canal. The Selachians alone, besides the ovary, have long oviducts which frequently open into a true matrix, and they produce either living ones or eggs enveloped with a horny substance. In most Fishes, however, copulation does not take place, the female depositing her ova, and the male impregnating them after extrusion.

Of all the classes of animals, that of fishes is the most difficult to sub-divide into orders from fixed and sensible characters. After many attempts, I have decided upon adopting the following arrangement, which, though it militates in some instances against precision, does not separate natural families.

Fishes form two distinct series, that of FISHES, *properly* *so styled,* and that of the CHONDROPTERYGII, otherwise called CARTILAGINOUS FISHES.

The general character of the latter consists in the absence of the bones of the upper jaw, whose place is supplied by those of the palate; their whole structure also exhibits evident analogies which we will describe: it is divided into three orders.

The CYCLOSTOMI, whose jaws are soldered in an immovable ring, with branchial openings.

The SELACHII, which have the branchiæ of the Cyclostomi but not their jaws.

The STURIONES, whose branchial opening is the usual fissure furnished with an operculum.

The other series, or that of the ORDINARY FISHES, presents a primary division in those where the maxillary bone and the palatine arch are fixed to the cranium: they constitute an order which I call that of the PLECTOGNATHI, and are divided into two families: the GYMNODONTES and the SCLERODERMI.

I next find fishes with perfect jaws, but whose branchiæ, instead of being pectiniform, resemble a series of small tufts; they also constitute an order which I call LOPHOBRANCHII, that comprises but a single family.

There then remains an immense number of fishes to which no other characters can be applied than those of the external organs of motion. After much long, and laborious research, I have found that the least objectionable of these characters is the one employed by Ray and Artedi, drawn from the nature of the first rays of the dorsal and anal fin. Thus the ordinary fishes are divided into MALACOPTERYGII, where all the rays are soft, with the occasional exception of the first of the dorsal or of the pectorals, and into ACANTHOPTERYGII, in which the first portion of the dorsal, or of the first dorsal where there are two, is always supported by spinous rays, and where some of the same are always found in the anal fin, and at least one in each of the ventrals.

The first may be divided by a reference to the position of their ventral fins, which are sometimes situated behind the abdomen, sometimes suspended to the apparatus of the shoulder, or are totally wanting.

We thus arrive at the three orders of the MALACOPTERYGII ABDOMINALES, the SUBBRACHIATI and the APODES, each of which comprizes certain natural families to be described. The first is particularly numerous.

It is impossible, however, to apply this mode of division to the ACANTHOPTERYGII; and their subdivision in any other way than by that of natural families is a problem that I have hitherto vainly endeavoured to solve. Fortunately many of these families are possessed of characters nearly as exact as those which could be given to true orders.

It is, besides, impossible to assign to the families of fishes, the same marked gradation that is visible among those of the Mammalia. Thus the Chondropterygians are connected with Serpents on the one hand by the organs of the senses, and some of them even by those of generation; while the imperfection of the skeleton in others allies them to the Mollusca and Worms.

As to the Ordinary Fishes, if any one system is found more developed in some than in others, it is not sufficiently preeminent, nor does it exercise a sufficient influence over the whole, to compel us to pay any regard to it in a methodical arrangement.

We will successively treat of these two series, commencing with the most numerous, that of Ordinary Fishes, and placing at its head the order richest in genera and species.

ORDER I.

ACANTHOPTERYGII.

The Acanthopterygii form the first and by far the most numerous division of Ordinary Fishes. They are recognized by the spines which occupy the place of the first rays of their dorsal, or which alone support the first fin of the back, where there are two; sometimes instead of a first dorsal, there are only a few free spines. The first rays of their anal are also spines, and there is generally one to each ventral.

The relations between the Acanthopterygii are so multiplied, and their different natural families present so much variety in the apparent characters which we might suppose would indicate orders or other subdivisions, that it has been found impossible to divide them otherwise than by these same natural families, which we are compelled to leave together.

FAMILY I.

PERCOIDES.(1)

This family is so called because its type is the Common Perch. It comprehends fishes with oblong bodies, covered with scales that are generally hard or rough, and whose operculum or preoperculum, and frequently both, have dentated or spinous edges, and whose jaws, the fore-part of the vomer, and generally the palatine bones, are furnished with teeth.

The species are extremely numerous, particularly in the seas of hot climates; their flesh is generally wholesome and agreeable.

In a vast proportion of these Perches, the ventral fins are inserted under the pectorals: they form a first division which may be called PERCOIDES THORACICI.

They were nearly all comprised by Linnæus in his genus PERCA, but we have been compelled to divide them as follows, from the number of the branchial rays, that of the dorsal fin and the nature of the teeth.

In the first subdivision we find seven rays in the branchiæ, two fins on the back, and all the teeth small and crowded.(2)

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(1) In my first edition this family also comprehended the *Buccæ Loricatæ*, the *Scienoïdes* and the *Sparoïdes*. It was necessary to detach these three new families from it, and I think I have been fortunate enough to discover sufficient characters for that purpose.

(2) The original expression *en velours* is one of the many instances in which the

Perca, Cuv.

The true Perches have the preoperculum dentated; the bony operculum terminated by two or three sharp points and a smooth tongue. Sometimes the sub-orbital and the humeral are slightly dentated.

P. fluvialis, L.; Bl. 52. (The Common Perch.) Greenish; broad, vertical, blackish bands; ventral fins, and the anal red; one of the most beautiful and best of the European fresh water fishes. It inhabits pure and running streams; its eggs are united by a viscid matter into long strings, which form a kind of net-work.

North America produces several neighbouring species.(1)

Labrax, Cuv.

Distinguished from the Perches by scaly opercula terminating in two spines, and by a rough tongue.

L. lupus, Cuv. *Perca labrax*, L.; *Sc. diacantha*, Bl. 302; *Bars Commun; Spigola* of the Italians; Cuv. and Val. II, xi. A large fish found on the coast of Europe; it is highly flavoured, and of a silvery hue. It is particularly common in the Mediterranean, and is the *Lupus* of the Romans and the *Labrax* of the Greeks. The young ones are usually spotted with brown.

The United States produce a large and beautiful species, *Labr. lineatus*, Cuv. *Sciena lineata*, Bl. 304; *Perca saxatilis*, Bl. Schn. pl. 20, with longitudinal blackish stripes.(2)

We might also separate from Labrax a species of the United States whose scales extend to the maxillary bone, *Labrax mucronatus*, Cuv. and Val. II, xii. The

Lates, Cuv.

Hardly differs from the Perch except in having deep notches and

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words of our author bid defiance to all English synonymes. By this term he means to convey the idea of numerous small teeth placed so close together as to resemble the pile on velvet. *Am. Ed.*

(1) *Perc. flavescens*, Cuv. and Val., II, p. 46;—*P. serrato-granulata*, Ib. 47;—*P. granulata*, Ib. 48, and pl. ix;—*P. acuta*, Ib. 49, and pl. x;—*P. gracilis*, Ib. 50.

Add, *P. Plumieri*, or *Sciæna Plumieri*, Bl. 306, or *Centropome Plumier* and *Cheilodiptére chrysoptère*, Lacép. III, xxxiii;—*P. ciliata*, Kuhl;—*P. marginata*, Cuv. and Val. 53.

(2) It is also the *Perca Mitchilli*, New York Trans. v. I, 413. [The Common *Rockfish* of our market. *Am. Ed.*]

Add *Perca elongata*, Geoff., Eg., pl. xix, 1;—*Labr. waigiensis*, Less. and Garn., Cuv. and Val., II, 33;—*Labr. japonicus*, Cuv. II, 85.

even a small spine at the angle of the preoperculum, and also deeper notches in the sub-orbital and humeral bones.

Lates niloticus, Cuv.; *Perca nilotica*, L.; *Keschr* of the Arabs, Geoff. Egyp. Poiss. pl. ix, f. 1. A very large and excellent fish of a silver colour, known to the ancients by the name of *Latus* or *Lates*.

Other species are found in the rivers of India,(1)

Centropomus, Lacep.

The preoperculum dentated, but the operculum obtuse and unarmed. Only one species is known.(2)

Centrop. undecimalis, Cuv.; *Sciœna undecimalis*, Bl. 305; Cuv. and Val. II, xiv. A large and excellent fish, known throughout hot parts of America by the name of *Pike*, whose muzzle, in fact, is depressed like that of our true Pike; but its teeth are small and crowded, and all its remaining characters are those of Perches with two dorsal fins; it is of a silver colour tinged with greenish; a blackish lateral line.(3)

Grammistes, Cuv.

Preoperculum and operculum, armed with spines, but without notches; the dorsals approximated; scales small, and as if buried in the epidermis; no sensible spine to the anal fin.

The species are small, with longitudinal white streaks on a blackish ground. They inhabit the Indian Ocean.(4)

Aspro, Cuv.

The body elongated; the two dorsals separate; ventrals broad; teeth small and crowded; head depressed; the muzzle extending beyond the mouth and terminating in a rounded point.

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(1) The *Pêche naire* of Pondichery, or *Cockup* of the English at Calcutta (*Lates nobilis*, Cuv.) Russ. II, cxxxi, Cuv. and Val. II, xiii, which is also the *Holocentre heptadactyle*, Lacép.;—*Holoc. calcarifer*, Bl. 244.

(2) Lacép. in his genus Centropomus, comprehends several Fishes which have not its characters, such as the *Labrax lupus*, the *lates*, &c.

(3) Bl. pl. 305, has improperly given it a red tinge; the *Sphyréne orvet*, Lacép., V, pl. iv, f. 2, is nothing else than a bad figure of this Fish; it is also the *Camuri* of Marcgrave.

(4) *Gram. orientalis*, Bl., Cuv. and Val., II, pl. xxvii. *La Sciéne rayée*, Lacép. IV, 323; his *Perséque tricanthe*, Ib. 424; his *Per. pentacanthe*, Ib.; his *Bodian six raies*, Ib. 302; his *Centropome six raies*, V, 690; the *Perca bilineata*, Thunb. Nov. Act. Stokh. XIII, pl. v, p. 142, appear to be varieties of it.

Two species inhabit the fresh waters of Europe; their flesh is light and agreeable.

Aspro vulgaris, Cuv.; *Perca asper*, L.; Bl. 107, 1 and 2; Cuv. and Val. II, xxvi. From the Rhone and its tributaries; greenish; three or four blackish vertical bands; eight spines in the first dorsal.

A. Zingel; Perca Zingel, L.; Bl. 105. From the Danube; larger than the vulgaris, but similar as to colours; thirteen spines in the first dorsal.

This division also comprises some fishes whose singularity of conformation gives rise to several subgenera.

HURO, Cuv. and Val.

All the characters of a true Perch, except that the preoperculum is not dentated.(1)

ETELIS, Cuv. and Val.

All the characters of a true Perch; hooked teeth in the jaws, but not as in the Lucio-Perca, in the palate.(2)

NIPHON, Cuv. and Val.

Teeth as in the Perch, and strong spines at the lower part of the preoperculum, and on the operculum.(3)

ENOPLOSUS, Lacep.

Characters of the Perches; angle of the preoperculum more deeply dentate; the body much compressed, and together with the two dorsals, of great vertical height.(4)

DIPLOPRION, Kuhl and Van Hassel.

All the characters of a Perch; body compressed; a double dentated border on the lower part of the preoperculum, and two spines on the operculum.(5)

APOGON, Lacep.

Body short, furnished, as well as the opercula, with large scales that are easily dislodged; the two dorsals very separate, and a double dentated border on the preoperculum. They are small fishes, and generally red. One of them,

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(1) *Huro nigricans*, Cuv. and Val., II, pl. xvii.

(2) *Etelis carbunculus*, Ib. pl. xviii.

(3) *Niphon spinosus*, Ib. XIX.

(4) *Enoplosus armatus*, Ib. XX, or *Chætodon armatus*, J. White.

(5) *Diploprion fasciatum*, Cuv. and Val. II, xxi.

Ap. rex mullorum, Cuv.; *Mullus imberbis*, L.; commonly called *Roi des Rougets*, Cuv. Mém. du Mus. I, 336 and pl. xi, f. 2, three inches long; red; a black spot on each side of the tail; is found in the Mediterranean.(1)

CHEILODIPTERUS, Lacep.

All the characters of the Apogons, differing only in the fangs or long and pointed teeth with which the jaws are armed.

They inhabit the Indian seas, are small, and generally marked with longitudinal streaks.(2)

POMATOMUS, Riss.

Two separate dorsals like the Apogons, and the scales dislodged with the same facility; but the preoperculum is simply striate, the operculum emarginate, and the eye enormous; very small crowded teeth (*en velours ras*).

Pomat. telescope, Risso; Cuv. and Val. II, xxiv. The only species known; it inhabits the Mediterranean, and is excessively rare.

A second subdivision comprises the Percoides with two dorsal fins, and long and pointed teeth mingled with the small and crowded ones.

AMBASSIS, Commers.

Nearly the same form as that of the Apogons; a double notch towards the lower part of the preoperculum; the operculum terminating in a point. They are distinguished from the Apogons by the contiguity of their two dorsals, and by a spine before the first.

Strictly speaking, they do not perhaps belong to this family, for there are no appendages to the pylorus.

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(1) This is the *Apogon rouge*, Lacep.; the *Corvulus*, Gesner, p. 127, 3; the *Amia* of Gronovius, Zooph., IX, 2; the *Centropomus rubens*, Spinol., An. Mus. X, XXVIII, 2, the *Dipterodon ruber*, Rafin. Caratt. No. 715, &c. The *Dipterodon hexacanthe*, Lacép. III, pl. iv, f. 2, and the *Ostorinque fleurieu*, Id. III, xxxii, 2, also belong to this genus. For the numerous species of this genus foreign to Europe, see Cuv. and Val., II, 151, et seq.

(2) *Cheilod. 8-vittatus*, Cuv., Lacep. III, xxxv, 1; which is his *Cheilod. rayé*, III, p. 543, and his *Centropome macrodon*, IV, 273.—*Cheilod. arabicus* (*Perca lineata*, Forsk), Cuv. and Val., II, pl. xxiii.—*Ch. 5-lineatus*, Ib. p. 167.

They are small Fresh-water fishes of the East Indies, which swarm in the pools and rivulets; several of them are transparent.(1)

One of them is common in a pond in the island of Bourbon, where they are prepared as anchovies, *Ambassis Commersonii*, Cuv. and Val., II, xxv.(2)

To this division belongs the

LUCIO-PERCA, Cuv.

Called by the French *Brochets-Perches*, or *Perch-Pike*, because, in addition to the characters of a Perch, they are possessed of teeth somewhat resembling those of the Pike. The edge of their preoperculum has but one simple emargination; their dorsals are separate; some of the maxillary and palatine teeth are long and pointed.

Luc. sandra, Cuv.; *Perca lucio-perca*, L.; *Sandre d'Europe;* Bl. pl. li; Cuv. and Val. II, pl. xv. Longer than the Perch; greenish, with vertical brown bands; from three to four feet in length; an excellent fish, found in the lakes and rivers of Germany, and of Eastern Europe.(3)

A second division comprises the Percoides with seven branchial rays and one dorsal. They are subdivided in nearly the same way as the preceding ones, as by their teeth which are either hooked or all small and crowded; notches and spines on the opercula, &c.

In the subdivision, furnished with hooked teeth, we find,

SERRANUS, Cuv.

Preoperculum dentate; the bony operculum terminating in one or several points. This genus contains a vast number of species, and may be subdivided as follows:

SERRANUS, *properly so called,*

Or the Sea-Perch. No apparent scales on either of the jaws. Several beautiful species inhabit the Mediterranean, such as,

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(1) Several of them are comprised by M. Ham. Buchanan among his Chandæ.

(2) It is the *Centropome ambasse*, Lacép., IV, 273, and his *Lutjan gymnocephale*, IV, 216 and III, pl. xxiii, f. 3. For the other species see Cuv. and Val., II, 181, et seq.

(3) Add the *Berschik*, or *Sandre bâtard* (*Perca volgensis*, Gm.);—the *Lucio-perca americana*, Cuv. and Val., II, pl. xvi, p. 122.

Perca scriba, L.; Cuv. and Val. II, xxviii, so named from having some irregular blue lines on the head.(1)

Perca cabrilla, L.; Cuv. and Val. II, xxix. Three oblique bands on the cheek.(2) It is also found in the ocean. This species, and perhaps the preceding one, were known to the Greeks by the name of χαννη, and were thought to consist exclusively of females. Cavolini assures us, that in every specimen he examined, he found ovaries, at the lower end of which was a whitish part which might be considered as the milt. He believes them to be hermaphroditical. The

ANTHIAS, Bl., *partim*,

Are Serrani, in which both jaws and the end of the muzzle are armed with very apparent scales.(3) The most remarkable species is,

Anth. sacer, Bl.(4) pl. cccxv; *Barbier de la Méditerranée;* Cuv. and Val. II, xxxi. A most beautiful fish, of a fine ruby red, changing to gold and silver, with yellow bands on the cheek. The third dorsal ray is more than double the height of the others; the ventrals are very long, and the lobes of the caudal terminate in filaments, the lower of which is the longest.(5)

MERRA.

Serrani, whose maxillary is destitute of scales, but whose lower jaw is covered with small ones. There is one of them found in the Mediterranean; the

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(1) It is also the *Perca marina*, Brunnich, the *Holocentrus marinus*, Laroche; the *Hol. argus* of Spinola, and the *Hol. maroccanus* of Bloch. The *Hol. fasciatus*, Bl. 240, appears to us nothing more than the same species somewhat changed.

(2) It is also the *Hol. virescens*, Bl.; the *Serranus flavus* and *cabrilla* of Rip.; the *Labrus chanus* of Gmel. or *Holocentre chani*, Lacép.; the *Bodian hiatule*, Id. &c. Add the *Sacchetto*, *Labrus hepatus*, L.; and *Lab. adriaticus*, Gm., or *Holocentrus siagonotus*, Laroche, &c.;—*Serranus vitta*, Quoy et Gaym., Voy. de Freycin., Zool., LVIII, 2;—*Hol. argentinus*, Bl. 235;—*Serr. radialis*, Q. et G., 316;—*Serr. fascicularis*, Cuv. et Val., II, xxx, and the other species described, Id. II, p. 239—249.

(3) Most of our Merræ are placed by Bloch among his Anthias, but we restrict this genus to the species answering to our definition of the same. So little regard has Bloch had to exactness, that his *Anthias sacer* does not even possess the character attributed to the genus Anthias, of a spineless operculum.

(4) This term *Sacer* was applied by the ancients to their *Anthias*, a large Fish very different from the one here described. See Cuv. et Val., II, p. 255 et seq.

(5) Add *Serranus oculatus*, Cuv. et Val., II, xxxii, and the other species described, Ib. p. 262—270.

Perca gigas, Gm. Three feet and more in length; of a clouded brown: it is also taken in the Ocean.

The Merræ, foreign to Europe, are extremely numerous; the dentation of the preoperculum, in several, becomes almost insensible;(1) but, generally, they can only be distinguished by their colours.

There are many in which the body is dotted with colours more or less vivid,(2) and others, in which it is marked with crowded spots.(3)

Some in which it is longitudinally striped,(4) or transversely,(5) or marbled in large patches,(6) or divided into two colours,(7) or, finally, of a more or less uniform tint.(8) Very few of them possess characters drawn from very apparent varieties of form. We will cite, however, the

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(1) These, when the muzzle is naked, constitute the BODIANUS, Bloch; they only differ from most of the HOLOCENTRI of the same author, in this diminished dentation. The HOLOCENTRI, when the muzzle is scaly, are called EPINEPHELI, and where this is the case with the BODIANI, they are called CEPHALOPHOLES. The LUTJANI and ANTHIÆ of Bloch differ from the HOLOCENTRI, in the absence of the spines on their operculum; in the first ones, the muzzle is naked; it is scaly in the others; but all these characters, of but little importance in themselves, are very badly applied to the species.

(2) They are the *Jacob Evertsen* of the Dutch, such as: *Bodianus guttatus*, Bl., 224;—*Cephalopholis argus*, Bl., Schn., pl. 61;—*Bodianus bænak*, Bl. 226;—*Holoc. auratus*, Ib. 236;—*Hol. cæruleo-punctatus*, Id. 242, 2;—*Labrus punctulatus*, Lacep., III, xvii, 2, &c.; and in America, *Perca guttata*, Bl. 312, or *Spare sanguinolent*, Lacép. IV, iv, 1;—*P. maculata*, Bl. 313, or *Spare atlantique*, Lac., IV, v, 1;—*Johnius guttatus*, Bl. Schn., or *Bonaci-arara*, Parra, XVI, 2;—*Lutjanus lunulatus*, Bl. Schn., or *Cabrilla*, Parra, XXXVI, 1;—*Bodianus guativere*, Parra, V;—*Holoc. punctatus*, Bl. 241, or *Pyra pixanga*, Marcg. 152;—*Gymnocephalus ruber*, Bl. Schn., 67, or *Carauna*, Marcg., 147;—*Bodianus apua*, Bl. 229.

(3) *Epinephelus merra*, Bl. 329;—*Holoc. pantherin*, Lacép, III, xxvii, 3;—*Serranus bontoo*, Cuv., Russel, 128;—*Serr. suillus*, Russ., 127;—*Labrus leopardus*, Lacép., III, xxx, 1;—*Holoc. salmonoïdes*, Ib., XXXIV, 3;—*Bodianus melanurus*, Geoffr., Egypt., XXI, 1.

(4) *Sciæna formosa*, Shaw, Russel, 129.

(5) *Holoc. tigrinus*, Bl., 237; Seb. III, xxvii;—*Hol. lanceolatus*, Bl., 242, 1;—*Anthias orientalis*, Id., 326;—*Anth. striatus*, Id. 324, which is also the *Anth. cherna*, Bl., Schn., Parra, XXIV; and the *Spare chrysomelane*, Lacép.

(6) *Serranus geographicus*, Kuhl, Cuv. et Val., II, p. 322.

(7) *Serranus flavo-cæruleus*, Cuv., which is the *Holoc. gymnose*, Lacép., III, xxvii, 2; his *Bodian grosse tête*, III, xx, 2, and his *Holocentre jaune et bleu*, IV, p. 369. It is also the *Serran bourignon*, Quoy et Gaym., Voy. Freycin., Zool., pl. lvii, 2.

(8) *Holocentrus ongus*, Bl., 234;—*Epinephelus marginalis*, Bl. 328, or *Holoc. rosmare*, Lacép., IV, vii, 2;—*Hol. oceanique*, Lacep., IV, vii, 3;—*Epinephelus ruber*, Bl., 331. For various other species, of which there are no figures, see descriptions in the second volume of our History of Fishes.

Ser. altivelis, Cuv.; Cuv. et Val., II, xxxv. Which has a higher dorsal than the others; it is sprinkled with round and black spots, on a ground of light brown; and

Serr. phaëton, Ib. pl. xxxiv, whose two middle caudal rays unite in a filament as long as the body.

We have separated from the Serrani, the

PLECTROPOMA, Cuv.

Only differing from them in the more or less numerous teeth of the lower edge of the preoperculum, which incline obliquely forwards,(1) and the

DIACOPE, Cuv.

Characterized by an emargination near the lower edge of the preoperculum, which receives a tuber of the interoperculum. The Indian Ocean produces some large and splendid species.(2)

MESOPRION, Cuv.

The dental characters and fins of the Serrani with their dentated preoperculum; the operculum terminating in an obtuse angle, not spinous.(3)

Numerous and beautiful species inhabit the two oceans.(4) Several of them are very large, and their flesh is excellent.

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(1) *Pl. melanoleucum*, Cuv.; or *Bodian melanoleuque*, Lacép.; or *Labre lisse*, Id., III, xxiii, 2; or *Bodian cyclostome*, Ib., XX, 1;—*Holoc. leopard*, Lacép., IV, p. 337; Cuv. et Val. II, xxxvi;—*Bodianus maculatus*, Bl., 228, or *Plectropome ponctué*, Freycin., Zool., XLV, 1;—*Holocentrus unicolor*, Bl., Schn., Seb., III, lxxvi, 10;—*Plect. puella*, Cuv. et Val. II, xxxvii, and the other species described in the second Vol. of our History of Fishes.

(2) *Diac. Sebæ*, Cuv., Seb., III, xxvii, 2, and Russel, 99;—*D. rivulata*, Cuv. et Val., II, xxxviii;—*D. macolor*, Cuv., Renard, 1, ix, 60;—*D. octolineata*, Cuv., or *Holoc. bengalensis*, Bl., 246, the same as the *Labrus 8-lineatus*, Lacép. III, xxii, 1, and as the *Sciæna kasmira*, Forsk; *Hol. 5. lineatus*, Bl., 289, is a variety of it;—*D. notata*, Cuv. Russel, 98; *D. quadriguttata*, Cuv., or *Spare leipsure*, Lacép. III, xv, 2;—*D. calveti*, Quoy et Gaym. Voy. Freycin. Zool., LVII, 1, and several other species described in the second vol. of our History of Fishes.

(3) Most of them were comprised in the genus *Lutjanus* of Bloch, but were there mingled with species of other families, either Scienoides or Labroides, of which we have made other genera.

(4) *Mesopr. unimaculatus*, Russel, 97;—*Anthias Johnii*, Bl., 318;—*Coius catus*, Buchan., 38, f. 30;—*M. 5-lineatus*, Russel, 110;—*M. monostygma*, Cuv., Lacép., III, xvii, 1;—*M. uninotatus*, Nob., Cuv. et Val., II, xxxix, Duham. part II, sect. IV, pl. iii, f. 2, and probably *Sparus synagris*, L., Catesb. II, xvii, 1;—*M. bucca-*

We now pass to Percoides with seven branchial rays, and a single dorsal, the teeth small and crowded.

Acerina, Cuv.

Cavities or depressions on the bones of the head; preoperculum and operculum with small spines, but not dentated. Two fresh-water species are found in Europe.

A. cernua; Perca cernua, L.; *Perche goujonnière;* Bl. 53, 2; Cuv. et Val. III, pl. xli. A small fish of an agreeable flavour, very common in all the fresh-water streams of Europe; it is of an olive colour, spotted with brown.

A. schraitzer; Perca schraitzer, L.; the *Schrætz;* Bl. 332. Larger, and has interrupted blackish lines on the sides: it inhabits the Danube.(1)

Rypticus, Cuv.

Small spines on the opercula; the scales, like those of the Grammistes, small and concealed in a thick epidermis; particularly distinguished from the Grammistes by the single dorsal.

R. saponaceus; Anthias saponaceus, Bl., Schn.; Parra, xxiv, 2. An American species which has received this name on account of its soft skin, that is smeared with a frothy viscosity.(2)

Polyprion, Cuv.

This genus, in addition to dentations in the preoperculum and spines, or the operculum, is marked by a bifurcated and very rough crest on the latter; the bones of the head are generally covered with asperities.

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nella, Cuv., the figure of which was taken by Bloch from Plumièr, and, with some alteration given as the *Sparus erythrinus*, pl. 274;—*Bod. aia*, Bl., 227, or *Acara aia*, Margr., 167;—*Mes. chrysurus*, Cuv. et Val., II, xl, which is also the *Sparus chrysurus*, Bl., 262, or *Acara pitamba* of Marcgr., 155; the *Anthias rabirrubia*, Bl., Schn., Parra, XXII, 1; the *Spare demi-lune*, Lacep. IV, iii, 1; and the *Colas* of Guadeloupe, Duham. Sect. IV, pl. xii, 1;—*M. cynodon*, Cuv. or *Anthias caballerote*, Bl., Schn., Parra, XXV, 1;—*Anth. jocu*, Bl., Schn., Parra, XXV, 2;—*Sp. tetracanthus*, Bl., 279, which is also the *Vivanet gris*, Lacép., IV, iv, 3; and the *Lutjanus acutirostris*, Desmar.;—*M. sillao*, Russel, 100;—*M. lunulatus*, Cuv., Mungo Park, Lin. Trans., III, xxxv, 6;—*Lutj. erythropterus*, Bl. 249;—*Lutj. lutjanus*, Id., 245;—*Sparus malabaricus*, Bl., Schn.;—*M. rangus*, Cuv., Russel, 94;—*M. rupilli*, Id., 95;—*Alphestes gembra*, Bl., Schn., pl. 51, 2, and the other species described in our second volume.

(1) Add *Perca acerina*, Guldenst., Nov. Comment. Petrop., XIX, 455.

(2) Add *Rypticus arenatus*, Cuv. et Val., III, pl. xlvi.

Polyp. cernium, Valenc.; Mem. du Mus. tom. XI, p. 265; and Cuv. and Val., III, pl. xlii.(1) An enormous species found in the Mediterranean; it is clouded with brown on a lighter ground.

CENTROPRISTIS, Cuv.

All the characters of Serranus except that there are no canini, and that all the teeth are small and crowded; preoperculum dentated and operculum spinous.

Centrop. nigricans, Cuv.; *Coryphæna nigrescens*, Bl., Schn.; Cuv. and Val., III, pl. xliv. (The Black Perch.) Blackish brown; the caudal fin trilobate when young. It becomes large, and is found in the United States.(2)

GRISTES, Cuv.

Only differs from Centropristis in the margin of the preoperculum, which is entire and not dentated.(3)

The genus PERCA, as defined by Artedi and Linnæus, terminates here; but there remains a number of fishes which approach it, although peculiar characters compel us to arrange them in separate genera.

We will begin with those Percoides which have less than seven branchial rays. We may also subdivide them according to the number of their dorsals, and the nature of their teeth.

Of those with a single dorsal, some have hooked teeth among the others: they are the

CIRRHITES, Commers.

Preoperculum, as in Mesoprion, dentated, and the operculum terminating in an obtuse angle; distinguished by the inferior rays of the pectoral, which are stouter and not branched, that extend a little beyond the membrane; but six rays to the branchiæ. They all inhabit the Indian Ocean.(1)

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(1) The *Amphiprion australis*, Bl., Schn., pl. 47, or *americanus*, Ib., p. 205; and the *Amph. oxygeneios*, Ib., or *Perca prognathus*, Forst. do not appear to us distinguishable from the *cernium*.

(2) It is also the *Lutjan trilobé*, Lacép. II, xvi, 3, and the *Perca varia*, Mitchill, Trans. New York, I.—Add *Perca trifurca*, L.;—*La Scorpéne de Waigiou*, Quoy et Gaym. Freycin., Zool., LVIII, 1; and the other species described in the third Vol. of our History of Fishes.

(3) The *Labre salmoïde*, Lacep. IV, v, 2, or *Cychla variabilis*, Lesueur, Ac. Nat. Sc. Phil., Cuv., et Val., III, pl. xlv;—*Gr. macquariensis*, Ib., p. 58.

Others with less than seven branchial rays are furnished with small and crowded teeth only, or, at least, have no hooked ones.

Chironemus, Cuv.

The inferior part of the pectorals with the same simple rays as the Cirrhites.(2)

Pomotis, Cuv.

Fishes, with a compressed and oval body, characterized by a membranous prolongation at the angle of the operculum. They inhabit the rivers, &c. of America.(3)

Centrarchus, Cuv.

Characters of the Pomotis, and numerous spines in the anal fin; a group of small and crowded teeth on the tongue.(4) From America.

Priacanthus, Cuv.

The body oblong, compressed, and, as well as the entire head, and even both jaws, covered with small rough scales; preoperculum dentated and its angle spiniform and dentated. The seas of hot climates.(5)

Dules, Cuv.

The operculum, as in Centropristis, terminating in spines; preoperculum dentated and small; crowded teeth; but six rays to the branchial membrane.(6)

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(1) The *Cirrhite tacheté*, Lacép., V, 3, which is also his *Labre marbré*, III, v, 3, and p. 492;—the *Cirrhite pantherin*, or *Spare pantherin*, Ib., IV, vi, 1, and p. 160, and Seb., III, xxvii, 12;—*Cirrhites vittatus*, Cuv., Renard, I, xviii, 102;—*Cirrh. aprinus*, Cuv. et Val., III, xlvii, &c.

(2) One species only is known, *Chiron. georgianus*, Cuv. et Val., III, p. 78; from New Holland.

(3) *Pomotis vulgaris*, Cuv., or *Labrus auritus*, L., called *Pond-Perch* in the United States. Catesb., II, viii, 2, Cuv. et Val., III, pl. 49.

(4) *Centrarchus æneus*, Cuv., or *Cychla ænea*, Lesueur, Ac. Nat. Sc. Phil.;—*C. sparoïdes*, or *Labre sparoïde*, Lacep., III, xxiv, 2;—*Labre iris*, Lac., IV, v, 3, which is also his *Labre macroptère*, III, xxiv, 1.

(5) *Anthias macrophtalmus*, Bl. 319, or *Catalufa*, Parra, XII, 1;—*Anthias boops*, Bl. Schn. 308;—*Sciæna hamruhr*, Forsk.;—*Labrus cruentatus*, Lacép. III, ii, 2, and the other species described in our third volume.

(6) *Dules auriga*, Cuv. et Val., III, li;—*D. tæniurus*, Ib., LIII, and the other species described vol. III.

D. rupestris, Cuv., a species resembling a carp, and highly flavoured, is found in the fresh waters of the isles of Bourbon and of Mauritius, where it is much esteemed.(1)

THERAPON, Cuv.

Preoperculum, dentated; operculum terminating in a stout spine; a strongly emarginate dorsal between the spinous and soft part: teeth of the external row pointed and stronger than the rest. In some, the teeth of the vomer fall out at an early period. They inhabit the waters of India, and are remarkable for a natatory bladder, divided into two chambers by a stricture.(2)

It is hardly possible to separate the DATNIA from them, although they want the palatine teeth; their profile is more rectilinear; their dorsal less emarginate.(3)

PELATES,

Internal and opercular characters, the same as in Therapon; but the teeth are uniformly small and crowded, and the dorsal but slightly emarginate.(4)

HELOTES, Cuv.

Also very similar; the dorsal deeply emarginate; they are particularly distinguished by the anterior range of teeth, which are tribolate.(5)

Most of these fishes are marked with longitudinal blackish lines on a silvery ground.

The Percoides, with less than six branchial rays and two dorsals, constitute but two genera.

TRICHODON, Steller.

Preoperculum with strong spines, operculum terminating in a flat point; no scales; mouth cleft almost vertically. But one species is known,

Tr. Stelleri, Cuv.; *Trachinus trichodon;* Pall. Petersb. Mém.

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(1) This is the *Centropome de roche*, Lacép., IV, 273.

(2) *Holocentrus servus*, Bl., 238, 1, or *Sciæna jerbua*, Forsk.;—*Hol. 4-lineatus*, Bl. 238, 2;—*Ther. puta*, Cuv. Russel, pl. 126;—*Ther. theraps*, Cuv., Cuv. and Val., III, liv, and the others described Vol. III.

(3) *Datnia Buchanani*, or *Coius datnia*, Buchanan, pl. ix, f. 29, and Cuv. and Val., III, lv;—*Dat. cancellata*, Ib., p. 144.

(4) *Pelates quinque-lineatus*, Cuv., et Val., III, 56.

(5) *Helotes 6-lineatus*, Cuv., et Val., III, lvii, or *Esclave six lines*, Quoy et Gaym., Voy. de Freycin., Zool., LXX, 1.

[illegible] From the north of the [illegible]

[illegible]

[illegible] mouth small: small crowded [illegible] terminating in a [illegible] continuous dorsal; spines of the [illegible]

[illegible] and much esteemed for [illegible] The most remarkable [illegible]

[illegible] distinguished by the first [illegible] a filament as long as [illegible] small. There is

[illegible] 3. [illegible] Rus- [illegible] which is [illegible]

[illegible] which have more than [illegible] genera are known, all of [illegible] their ventrals have [illegible] other Acanthop- [illegible]

[illegible]

[illegible] oper- [illegible] a stout [illegible] are found [illegible]

[illegible] posterior dor- [illegible] cannot [illegible] Ruppel, [illegible] given by [illegible] termination [illegible] of Bloch and of [illegible] and his [illegible] also the *Sciæna* [illegible] Bl., Schn., [illegible] — [illegible] *rubrum*, Bennet.

Myripristis, Cuv.

The brilliancy, shape and scales of the Holocentra, but the preoperculum has a dentated double border, and there is no spine at the angle. This genus is remarkable for a natatory bladder divided into two chambers, the anterior part of which is bilobate and attached to the cranium in two places, where the latter is only closed by membrane, and which correspond to the sacs of the ears. They inhabit the hot parts of both oceans.(1)

Beryx, Cuv.

Differs from Myripristis in having but a single short dorsal, with but a few small spines, almost hidden in its anterior edge; ten soft rays in the ventrals.(2) It is impossible to remove from it the

Trachichthys, Shaw,

In which, with the same roughness that exists in the three preceding genera, and the same little dorsal that is seen in Beryx, we find a flat spine at the lower part of the preoperculum, and one on the shoulder; the abdomen and sides of the tail are covered with large carinated scales.(3)

All the Percoides of which we have hitherto spoken, have their ventrals inserted under the pectorals; there are some genera, however, in which they are differently located.

In the Percoides Jugulares, they are placed on the throat further forwards than the pectorals.

Trachinus, Lin.

A compressed head, approximated eyes, and an oblique mouth; the

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Fishes of Ceylon, pl. iv;—*Hol. leo*, Cuv., Ren., I, xxvii, 148, a very bad figure;—*Sciæna spinifera*, Forsk;—*Hol. hastatum*, Cuv. et Val., III, lix;—*Hol. diadema*, Lacép., III, ix, 3, or *Perca pulchella*, Bennet, Zool. Journ. III, ix, 3;—*H. sammara*, or *Sciæna sammara*, Forsk, or *Labre anguleux*, Lacép., III, xxii, 1, and the other species described in our third volume.

(1) *Myripristis jacobus*, Cuv., Desmar., Dict. Class. d'Hist. Nat.;—*M. japonicus*, Cuv. et Val., III, lviii;—*M. botche*, Cuv., Russel, 105;—*M. parvidens*, Cuv., Id., 109;—the *Lutjan hexagone*, Lacep. IV, 213; his *Holocentre Thunberg*, Ib. 367; his *Centropome rouge*, Ib., 273; the *Sciæna murdjan*, Forsk, also belong to this genus. See Vol. III of our Icthyology.

(2) *Beryx decadactylus*, Cuv. et Val. III, 222;—*B. lineatus*, Ib. 226, and pl. lxx.

(3) *Trachichthys australis*, Shaw, Nat. Misc., No. 578: and Gen. Zool., IV, part II, p. 260.

first dorsal very short, the second very long; pectorals large, and a stout spine on the operculum. They generally remain concealed in the sand; wounds inflicted by the spines of their first dorsal are much dreaded, but their flesh is esteemed. Several species are found in the Atlantic, &c.

Trach. draco, L.; Salv., 72; *Trach. lineatus*, Bl. Schn., pl. x; and Penn., Brit. Zool., III, xxix. (The Dragon Weaver.) Grey and reddish, with blackish spots; blue streaks and yellow tints; thirty rays to the second dorsal; flanks obliquely striated.

Trach. vipera, Cuv.; *Boideroc;* Penn. 28; Bl., 61. (The Otter-Pike.) Smaller than the draco and paler, with smooth flanks and twenty-four rays in the second dorsal. It is more dreaded than the preceding species, in consequence of its diminished size, which renders the fishermen more liable to be stung by it.

Trach. araneus, Riss.; Salvian, 71; copied Willugb., pl. S. 10, f. 2. Higher; twenty-eight rays to the second dorsal; six or eight black spots along the flank. From the Mediterranean.

Trach. radiatus, Cuv.; Cuv. and Val., III, lxxii. Twenty-five rays in the second dorsal; head shagreened and rough; flanks alternately marked with large black rings, and full spots.

The Trachini of remote seas are unknown to us.

PERCIS, Bl. Schn.

These fishes, in some respects, are the representatives of the Trachini in the seas of hot climates. They principally differ from them in the depression of their head, and by having hooked teeth in the anterior part of the jaws and vomer; but there are none in the palate. Their first small dorsal is somewhat more closely united to the long one which follows it.(1)

PINGUIPES, Cuv.

More heavily built than the Percis; strong conical teeth; fleshy lips and teeth in the palate; thick ventrals.

Ping. brasilianus, Cuv. et Val., III, lxxiv. From Brazil, the only species known. In

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(1) *Percis maculata*, Bl., Schn., pl. 38;—*P. semi-fasciata*, Cuv., et Val., III, lxxiii;—*P. cylindrica*, or *Sciæna cylindrica*, Bl., 299, 1, which is also the *Bodianus Sebæ*, Bl., Schn., Seb. III, xxvii, 16;—*P. cancellata*, Cuv., or *Labre tétracanthe*, Lacép., III, p. 473; and II, pl. xiii, f. 3, which is also his *Bodian tétracanthe*, IV, 302;—*P. ocellata*, Renard, I, vi, 42;—*P. colias*, Cuv. or *Enchelyopus colias*, Bl., Schn., p. 54, and the other species described in our third volume.

PERCOPHIS, Cuv.

The body, on the contrary, is much elongated; some of the teeth are very long and pointed, and the end of the lower jaw projects.

Percoph. brasilianus, Cuv.; *Perc. Fabre*, Quoy and Gaym., Voy. Freycin., Zool., liii, 1, 2. The only species known: also from Brazil.

One of the most remarkable genera of the Jugulares is that of

URANOSCOPUS, Lin.

So called because the eyes are placed on the superior surface of the nearly cubical head, and look upwards: the mouth is cleft vertically; the lower part of the preoperculum is crenate, and there is a stout spine to each shoulder; but six rays in the branchiæ. In the mouth and before the tongue is a long and narrow slip, which can be protruded at the will of the fish, and serves, it is said, to attract small ones, while it remains concealed in the mud. A remarkable peculiarity of their anatomy is the enormous size of the gall-bladder, a fact well known to the ancients.(1)

In some, the first dorsal, small and spinous, is separated from the second which is soft and long.

Uranos. scaber, L.; Bl. 173. Grey-brown, with irregular ranges of whitish spots. Although one of the most hideous of fishes, it is eaten. From the Mediterranean.

Very similar species are found in the Indian ocean, and in Brazil.(2)

Others have but one dorsal in which the spinous and soft parts are united. They are all foreign to our seas.(3)

In a third division of the Percoides, the ventrals are inserted further back than the pectorals: they are the PERCOIDES ABDOMINALES. The first genus is

POLYNEMUS, L.

So named because several of the inferior pectoral rays are free, and form so many filaments;(4) the ventrals are not very far back, and the pelvis is still suspended to the bones of the shoulder. They are allied to the Percoides by the teeth, either small and crowded, or bent back like those of a wool-card, which arm their jaws, vomer, and palate; but their snout is convex, and the vertical fins scaly as in many of the Scienoides: the two dorsals are separated, the preoperculum is dentated and the mouth deeply cleft: they are found in all the seas of hot climates.

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(1) Arist. Hist., An., lib. II, xv.

(2) Add *Uranosc. affinis*, *Ur. marmoratus*, *Ur. guttatus*, *Ur. filibarbis*, *Ur. Y græcum*; new species described in our third Vol.

(3) *Uranosc. lebeck*, Bl., Schn., p. 47; *Ur. monopterygius*, Ib. 49;—*Ur. lævis*, Ib., pl. viii;—*Ur. inermis*, Cuv., et Val., III, lxxi, and *Ur. cirrhosus*, two new species.

(4) From νημα (*a thread*).

Pol. paradiseus and *Pol. quinquarius*, L.; Seb. III, xxvii, 2; Edw., 208; Russel, 285. (The Mango Fish.) So called from its fine yellow colour: has seven filaments on each side, the first of which are twice the length of the body. The natatory bladder is wanting in this species, although it exists in all the others: it is the most delicious fish found in Bengal.

The filaments of the remaining Polynemi are shorter than the body, and their number is one of their specific characters. Some of them are large, and all are considered excellent food.(1)

In the succeeding genera the ventrals are altogether behind, and the pelvis no longer adheres to the bones of the shoulder. The first, for a long time, was even confounded with that of the Pikes: it is the genus

SPHYRÆNA, Bl. Schn.(2)

Large fishes of an elongated form with two separated dorsals, an oblong head, the lower jaw of which projects in a point before the upper one, and part of whose teeth are large, pointed and trenchant. Their preoperculum is not dentated nor their operculum spinous. There are seven rays to the branchiæ, and numerous pyloric appendages. One species is found in the Mediterranean,

Sph. vulgaris; Esox sphyræna, L.; *Sphyène spet*, Lacep.;(3) Bl. 389, which attains a length of more than three feet; back bronzed; belly silvery; brown spots when young.

Sph. picula, Bl. Schn.; Parr., xxxv, 5, 2; Lac., V, ix, 3. A closely allied American species. The same country produces another,

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(1) *Polyn. plebeius*, or *Emoï*, Brouss., Bl., 400;—*Pol. uronemus*, Cuv., Russel, 184;—*Pol. tetradactylus*, Shaw, Russel, 183;—*Pol. sextarius*, Bl., Schn., pl. iv;—*Pol. enneadactylus*, Vahl.;—*Pol. decadactylus*, Bl. 401;—*Polynemus americanus*, Cuv., which is the species improperly named by Bl., pl. 402, *paradisæus*, and of which M. de Lacépède has also improperly made a particular genus, his *Polydactyle plumier*, V, xiv, 3.

(2 Σφύραινα, dart.

(3) *Spet*, from *Espeto*, the Spanish name of the Pike.

Sph. barracuda, Cuv.; Catesb., II, pl. 1, f. 1. Which becomes much larger, and is nearly as much dreaded as the shark.

PARALEPIS, Cuv.

Small fishes resembling the Sphyrænæ, but whose second dorsal is so small and frail that it has been considered as adipose.(1)

MULLUS, Lin.

This genus is rather closely allied to the Percoides by several anatomical and external details, though the species which compose it present so many remarkable peculiarities that they might readily be made to constitute a separate family. Their dorsals are far apart; the entire body and opercula are covered with large scales which are easily dislodged; the mouth is slightly cleft and but weakly armed with teeth, and above all they are distinguished by two long cirri, which depend from the symphysis of the lower jaw. They are divided into two subgenera.

MULLUS, *properly so called.*

But three rays to the branchiæ, operculum spineless, and no teeth in the upper jaw; two broad plates of small teeth *en pavé*, on the vomer;(2) no natatory bladder. All the species are from Europe.

M. barbatus, L.; *Le Rouget;* Bl. 348, 2. (The Red Surmullet.) Profile nearly vertical; of a fine lively red; celebrated for the flavour of its flesh, and for the amusement it afforded the Romans, who took much pleasure in contemplating the changes of colour it undergoes when dying;(3) most common in the Mediterranean.

M. surmuletus, L.; Bl. 57. (The Surmullet.) Larger; profile less vertical; longitudinally striped with yellow; most common in the ocean.

UPENEUS, Cuv.

Teeth in both jaws, but very often none in the palate; a small spine on the operculum; four rays in the branchiæ; a natatory bladder. They are all from hot latitudes.(1)

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(1) Two or three small species described by Risso, 2d ed. f. 15 and 16, inhabit the Mediterranean.

(2) *En pavé*, teeth formed like paving stones, and placed as in a pavement. *Am. Ed.*

(3) Senec., Quest., Nat., III, c. xviii.

FAMILY II,

BUCCÆ LORICATÆ,

Or the *Mailed-Cheeks*, contains a numerous suite of fishes to which the singular appearance of their head, variously mailed and protected, gives a peculiar aspect that has always caused them to be arranged in special genera, although they have many close affinities with the Perches. Their common character consists in the sub-orbital being more or less extended over the cheek and articulated behind with the preoperculum. The Uranoscopus is the only one of the preceding family which has any thing like it, but the sub-orbital of the latter, although very broad, is connected behind with the temporal bones, and not with the preöperculum.

Linnæus divided them into three genera, TRIGLA, COTTUS, and SCORPÆNA; it has been found necessary, however, to subdivide them, and to add some of his GASTEROSTEI.

TRIGLA, Lin.(2)

The above character strongly marked; an enormous sub-orbital completely covering the cheek, and even articulated by an immovable suture with the preoperculum, so as to allow of no separate motion; sides of the head nearly vertical, giving it a form approaching that of a cube, or parallelopiped, the bones hard and rough. There are two distinct dorsals, and three free rays under the pectoral. They have about twelve cæca, and a broad and bilobate air-bladder. Several species, when caught, utter sounds which have procured for them in France their vulgar name of *Grondins;* in England they are called *Gurnards.*

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(1) *Mullus vittatus*, Gm., Lacép., III, xiv, 1; Russel, II, 158;—*M. Russelii*, Cuv., Russel, II, 157;—*M. bifasciatus*, Lacep., III, xiv, 2;—*M. trifasciatus*, Id., III, xv, 1, or *M. multibande*, Quoy et Gaym., Voy. Freycin., pl. 59, f. 1, and several other species described in the third Vol. of our Hist. des Poissons.

(2) Τρίγλη, the Greek name of the Mullet; Artedi united these two genera, and since they have been separated, this name has been assigned to the Gurnards.

TRIGLA, CUV.

The Triglæ, properly so called, have small crowded teeth in the the jaws and before the vomer. The pectorals are large, but not sufficiently so to raise them above the water. Numerous species are found on the coast of Europe.

Tr. pini, Bl., 355; *Trig. cuculus*, L.? Numerous vertical and parallel lines along each side of the body, intersecting the lateral line, and formed by folds of the skin, in each of which is a cartilaginous lamina; muzzle oblique. A good fish of a fine red colour.

Tr. lineata, L.; *Tr. adriatica*, Gm.; Bl. 35; Rond. 295; Martens, Voy. to Venice, II, pl. ii. The muzzle much more vertical, and the pectorals longer; the lines on the flanks encircle the body like rings.

Tr. hirundo, L.; Bl., 60.(1) Neither spines nor furrows on the sides; back brownish, sometimes reddish; pectorals one fourth of its length, the inner side edged with blue. It is the largest species taken on the coast of Europe, sometimes exceeding two feet in length.

Neighbouring species are found in India.(2)

Tr. lyra, L.; Bl., 350; Rond. 298. The muzzle divided into two dentated lobes; a stout spine on the operculum, super-scapular, and particularly on the humeral; spines along the dorsals; lateral line smooth; pectorals one third of its length; a beautiful fish, bright red above and a silvery white beneath.

Tr. gurnardus, L.; Bl. 58. A pointed spine on the shoulder and operculum; scales on the lateral line slightly carinate; generally grey-brown above, spotted with white, and white beneath; some of them, however, are reddish or red. Common in the markets in France.

Tr. cuculus, Bl., 59.(3) A neighbouring species which is always red with a black spot on the first dorsal.

Tr. lucerna, Brün.; Rondel. 287.(4) Scales on the lateral line higher than they are wide; the second dorsal spine prolonged into a filament.

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(1) It is the *Tr. cuculus*, of Brünnich.

(2) They are new; we describe them in the fourth volume of our Ichthyology.

(3) It is the *Tr. hirundo* of Brunnich; but it is neither the *cuculus* nor the *hirundo*, Lin.

(4) It is not the *Tr. lucerna*, Lin., but his *Tr. obscura*, described Mus. Ad. Fred. part II, and subsequently forgotten. The *Tr. lucerna*, L., is a factitious species.

Tr. aspera; Viviani; Rondel., 296. Short muzzle, rough scales, velvet head; sharp crests along the dorsals; temple emarginate. These two last species are small, and peculiar to the Mediterranean.(1)

M. de Lacépède has separated three genera from Trigla:

PRIONOTUS, Lacep.

American fishes resembling the *Tr. hirundo.* Their pectorals, however, are longer, and can support them in the air; their distinguishing character, however, consists in a band of small crowded teeth on each palatine.(2)

PERISTEDION, Lacép.

This genus has been separated from Trigla with still more propriety. The whole body is mailed with large hexagonal scales, forming longitudinal ridges; the muzzle is divided into two points, under which are branched cirri: no teeth.

P. cataphracta; Trigla cataphracta, L.; Rondel., 299. Red; a foot long; from the Mediterranean; the only species well known.(3)

The best of these divisions is

DACTYLOPTERUS, Lacep.

So celebrated under the name of Flying Fishes; the subpectoral rays are much more numerous and longer; and instead of being free, as in the preceding ones, they are united by a membrane so as to form a supernumerary fin, longer than the fish, which supports it in the air for some time. Thus they are seen flying above the surface of the water, in order to escape from Dolphins and other voracious fishes; they fall into it again, however, in a few seconds.

Their extremely short snout has the appearance of a hare-lip; the mouth is beneath, and the jaws are only furnished with rounded teeth, in small patches (*en petits pavés*); the helmet is flattened, rectangular, and rough; the preoperculum terminates in a long and stout spine, which forms a powerful weapon; all their scales are carinated.

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(1) Add the neighbouring species: *Tr. papilio,* Cuv.;—*Tr. phalæna;*—*Tr. sphinx,* described in our fourth volume.

(2) *Tr. punctata,* Bl. 353 and 354;—*Tr. strigata,* Cuv., *evolans,* L., or *lineatus,* Mitchill, New York Trans., I, pl. iv, 4;—*Tr. carolina,* L., or *palmipes,* Mitchill, I, cit.;—*Tr. tribulus,* Cuv.

(3) The fig. of Bloch, 349, is incorrect, and gives too many rays to the second dorsal. Several other species are found in the East Indies.

D. volitans; Trigla volitans, L.; Bl., 351, the Mediterranean species, is a foot long; brown above; reddish beneath; fins black, variously marked with blue.

D. orientalis, Cuv. Russel, 161, is a neighbouring species from the Indian Ocean.

CEPHALACANTHUS, Lacep.

Nearly the form, and particularly the head of the Dactylopteri; differing from them, however, in the total absence of supernumerary fins or wings.

C. spinarella; Gasterosteus spinarella, L.; Mus. Ad. Fred., pl. xxxii, f. 5. A very small species from Guiana, and the only one known.(1)

COTTUS, Lin.

Head broad, depressed, mailed, and variously armed with spines or tubercles; two dorsals; teeth front of the vomer, but none on the palatines; six rays in the branchiæ, and only three or four in the ventrals. The inferior pectoral rays, as in Trachinus, are not branched; few cæcal appendages, and no natatory bladder.

Those that inhabit fresh water have a nearly smooth head, and but one spine to the preoperculum; their first dorsal is very low. The most common species is

C. gobio, L.; Bl. 39, 1, 2. (The River Bull-head.) A small blackish fish, four or five inches in length.

The salt water species are more spinous, and when irritated their head becomes still more inflated. Such are

C. scorpius, L.; Bl. 40. (The Father-Lasher.) Three spines on the preoperculum.

C. bubalis, Euphrasen., New Stockh. Mem., VII, 95. Preoperculum with four spines, the first very long.

C. quadricornis, Bl., 108. (The Four-Horned Bull-head.) Distinguished by four quadrate and bony tubercles. These three species are found in the European seas, the latter more particularly in the Baltic.

America and the north of the Pacific Ocean produce much larger ones.(2) A small species is taken in the latter, whose singularity of form entitles it to notice: it is the

C. diceraus, Pall.; *Synanceia cervus*, Tilesius, Mém. Acad.

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(1) It is from Guiana, and not from India, as has always been asserted.

(2) *C. virginianus*, Will., X, 15, or *octodecim spinosus*, Mitchill, New York, Trans., IV, p. 380;—*C. polyacanthocephalus*, Pall., Zool., Russ., &c.

Petersb. III, 1811, p. 278. Internal edge of the first spine of the preoperculum, which is nearly as long as the head, furnished with six or eight prickles recurved towards its base.(1)

ASPIDOPHORUS, Lacep.—AGONUS, Bl. Schn.—PHALANGISTA, Pall.

Has been very properly separated from Cottus. Their body is defended by angular plates like that of a Peristedion, and there are no teeth in the vomer.

A species is found on the coast of Europe, *Cott. cataphractus*, L. A small fish but a few inches long, whose mouth opens beneath, and the whole of whose branchiostegous membrane is furnished with little fleshy filaments.

The north of the Pacific produces several others, in one of which, the mouth is also beneath, and the branchiostegous membrane villous.(2)

In others, the lower jaw projects beyond the upper one, and the branchiostegous membrane is smooth.(3)

The jaws of some are equal, and the two dorsals separated.(4)

Finally, there is one in India that has but a single dorsal. Lacepede has formed a genus for it which he calls ASPIDOPHOROIDES.(5)

Other groups have lately been observed, which are partly allied to Cottus and partly to Scorpæna.

HEMITRIPTERUS, Cuv.

The head depressed, and two dorsals as in Cottus; no regular scales on the skin, but teeth in the palate. The head is bristly and spinous, and has several cutaneous appendages. The first dorsal is deeply emarginate, a circumstance which has led some authors to believe they had three.

But one species is known, (from North America,) *Cottus tripterygius*, Bl., Schn.(6) which is taken along with the Cod.

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(1) Add, *C. pistilliger*, Pall., Zool., Russ., III, 143.

N.B. The *Cottus anostomus*, Pall., Zool., Russ., III, 128, is the Uranoscopus.

(2) *Phalangistes acipenserinus*, Pall. or *Ag. acip.*, Tiles.

(3) *Phal. loricatus*, Pall., or *Agonus dodecaedrus*, Tiles.;—*Phal. fusiformis*, Pall., or *Ag. rostratus*, Tiles.;—*Ag. lævigatus*, Tiles., or *Syngnathus segaliensis*, Id., Mém. Nat. Mosc. II, xiv.

(4) *Cottus japonicus*, Pall., Spic. Zool., VII, v, or *Ag. stegophthalmus*, Til. Mem. Petersb., IV, xiii, and Voy. Krusenstern, pl. 87;—*Ag. decagonus*, Bl., Schn., pl. xxvii.

(5) *Cottus monopterygius*, Bl., 178, 1 and 2.

(6) It is also the *Cottus acadianus*, Penn. Arct. Zool., VIII, 371; the *Cottus*

From one to two feet long, tinged with yellow and red, varied with brown.

Hemilepidotus, Cuv.

The head nearly similar to that of a Cottus, but there is only one dorsal; the palatines furnished with teeth; longitudinal bands of scales on the body, separated by others which are naked. A thick epidermis prevents these scales from being seen until the skin is dried.

The species known are from the north of the Pacific.(1)

Platycephalus, Bl.

This genus has been separated from Cottus for still stronger reasons. The ventrals are large, six-rayed, and placed behind the pectorals; the head is much depressed, with trenchant edges, and armed with spines, but is not tuberculous; the branchiæ have seven rays and they are covered with scales; a range of sharp teeth in the palatines, &c. They inhabit the Indian Ocean, and bury themselves in the sand to watch for their prey.

It is on this account that one species has been called *insidiator*,—*Cottus insidiator*, L.(2)

Scorpæna, Lin.

The head, like that of a Cottus, mailed and roughened, but compressed on the sides; body covered with scales; several rays in the branchiæ, and but a single dorsal. If we except the armature of the cheek, and the tubercles which frequently give them an odd appearance, they closely approximate to certain Percoides, such as the Acerinæ and the Centropristes; but though the inferior rays of their

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hispidus, Bl., Schn., 63; the *Scorpæna flava*, Mitchill, Ann. New York Lyc. I, ii, 8; and perhaps the *Scorpæna americana*, Gmel., Duhamel, Sect. V, pl. ii, f. 5; but this figure must be very incorrect.

(1) *Cottus hemilepidotus*, Tilesius, Mem. Ac. Petersb., III, pl. xi, f. 1, 2, which is probably the *Cottus trachurus*, Pall. Zoog., Russ., III, 138.

(2) It is also the *Cottus spatula*, Bl., 424, the *Cotte madegasse*, Lacép., III, ii, 12; the *Callionymus indicus*, L., Russel, 46, or *Calliomore indien*, Lacép.;—Add, *Platyc. endrachtensis*, Quoy et Gaym., Voy. Freycin. p. 353;—*Cott. scaber*, L., Bl. 189, Russel, 47;—the two species or varieties of Krusenstern, pl. 59:—the *Sandkruyper* of Renard, part II, pl. l, f. 210, and ten new species described in the fourth volume of our Icthyology; but the *Plat. undecimalis*, Bl. Schn., is a *Centropomus;* his *Pl. saxatilis* a *Cychla*, and his *Pl. dormitator* an *Eleotris*.

N.B. The only foundation of the genus CENTRANODON, Lacép., is the pretended *Silurus imberbis* of Houttuyn, which is a mere Platycephalus.

pectorals, as in Cottus, are articulated, they are simple and not branched.

Scorpæna, Cuv.

The head spinous, tuberculous, and without scales; small crowded teeth in both jaws and palatines; irregular cutaneous cirri on different parts of the body.

Sc. scropha, L.; Bl. 182; and better, Duham., sect. V, pl. iv. Redder; larger scales and more numerous cirri.

Sc. porcus, L.; Bl., 181, and Duham., sect. V, pl. iii, x, 2. Browner; scales smaller and more numerous. They live in troops among the rocks; wounds from their spines are considered very dangerous.(1)

The Tænianotes are Scorpænæ with a strongly compressed body, whose very high dorsal is united to the caudal.

Sebastes, Cuv.

All the characters of the Scorpænæ, except that there are no cutaneous cirri, and that the head is less rough and scaly.

There is a large species in the northern Ocean called the *Marulke*, and in some places *Carp*, the *Sebastes norvegicus*, Cuv.; *Perca marina*, Penn.; *Perca norvegica*, Müll. Bonnat., Encycl. Meth. pl. Icthy. f. 210. It is red, and frequently upwards of two feet in length. The Esquimaux dry it for food, and use its dorsal spines as needles. The Mediterranean produces another, very similar, but which has fewer dorsal rays, the *Sebastes imperialis*, Cuv.; *Scorpæna dactyloptera*, Laroche, Ann. Mus. XIII, pl. xxii, f. 9. Its palate is black, and it has no natatory bladder, although the contrary is the case with the preceding species.(2)

Pterois, Cuv.

Characters of the Scorpæna, properly so called, except that there are no palatine teeth, and that the dorsal and pectoral rays are excessively elongated.

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(1) Add, *Sc. diabolus*, Cuv., Duham. sect. V, pl. iii, f. 1;—*Sc. bufo*, Cuv., Parr, XVIII, 1, c;—*Sc. cirrhosa*, or *Perca cirrhosa*, Thunb., New. Stockhol. Mém., XIV, 1793, pl. vii, f. 2;—*Sc. papillosa*, Forst., Bl., Schn., 196;—*Sc. Plumier*, Lacép. 1, xix, 3;—*Sc. venosa*, Cuv., Ross., 56, and several new species described in our 4th vol.

(2) The pretended *Sc. malabarica*, Bl. Schn., 190, is a *Sebastes*, identical with the species of the Mediterranean.—Add, *Sc. capensis*, Gmel.;—*Holoc. albofasciatus*, Lacép. IV, 372;—*Perca variabilis*, Pall., or *Epinephelus ciliatus*, Tiles., Mem. Acad. Petersb., IV, 1811, pl. xvi, f. 1—6.

These fishes are from India, and are not less remarkable for this singular prolongation, than for the beauty of their colouring.(1)

BLEPSIAS.

The head compressed; cheeks mailed; fleshy cirri under the lower jaw; five branchial rays; ventrals very small, and one very high dorsal divided by emarginations into three parts.

The only species known are from the Aleutian islands.(2)

APISTUS.

The palatine teeth and entire dorsal of the the Scorpæna; but the few rays of their pectorals are all branched. Their distinguishing character consists in a stout spine on the suborbital, which, inclining from the cheeks, becomes a most dangerous weapon.(3) They are all small.

Those of the first division have a scaly body, and some of these have a free ray under a large pectoral.(4)

Others have ordinary pectorals, without free rays.(5)

In a second subdivision the body is naked; some of these also have a free ray under the pectoral,(6) and others not.(7)

AGRIOPUS.

No suborbital spine; the dorsal still higher than in Apistes, and reaching between the eyes; the neck elevated, muzzle narrowed, mouth small and but slightly dentated, and the body without scales.(1)

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(1) *Sc. volitans*, Gm., Bl., 184;—*Sc. antennata*, Bl., 185;—*Sc. Kœnigii*, Id. New Stokh. Mem., X, vii, and several new species described in our 4th vol.

(2) *Blennius villosus*, Steller, or *Trachinus cirrhosus*, Pall. Zoog., Russ., III, 237, No. 172. Blepsias is a name descended to us from the ancients without any characteristic designation.

(3) Ἀπιστὸς, *perfidus*.

(4) *Ap. aplatus*, Cuv., Russel, 160, B;—*Scorp. carinata*, Bl., Schn.

(5) *Cottus australis*, J. White, New. South, IV, 266;—*Ap. tænianotus*, Cuv., Lacép. IV, iii, 2, a figure entitled *Tænianote large raie*, but one which has nothing in common with the *T. large raie*, of the text, IV, 303 and 304, which is a Malacanthus, and the same that is represented, III, xxviii, 2, under the name of *Labre large raie;—Perca cottoïdes*, L., Mus. Ad. Fred., II, p. 84.

(6) *Ap. minus*, Cuv., Russel, 159;—*Sc. monodactyle*, Bl., Schn.

(7) The species are new, and described, as well as others of the preceding subdivisions, in our 4th vol.

PELOR.

The entire dorsal and palatine teeth of the Scorpænæ; no scales on the body; two free rays under the pectoral; anterior part of the head flattened; eyes proximate, dorsal spines very high, and almost free; the suborbital spine of Apistes is wanting, and their fantastic shape and monstrous aspect are alone sufficient to distinguish them from all other fishes. They inhabit the Indian Ocean.(2)

SYNANCEIA, Bl. Schn.

The appearance of these fishes is quite as hideous as that of a Pelor; their head is rough, tuberculous, uncompressed, frequently enveloped in a lax and fungous skin; their pectoral rays are all branched; their dorsals entire, and they have no teeth, neither in the vomer nor palatines; their frightful appearance induces the fishermen of the Indian Ocean, which they inhabit, to consider them as venomous.(3)

MONOCENTRIS, Bl. Schn.—LEPISACANTHUS, Lacep.

A singular genus; the body is short, thick, and completely mailed with enormous angular, rough, and carinated scales; four or five stout free spines supply the place of the first dorsal; each ventral consists of an immense spine, in the angle of which a few soft and almost imperceptible rays are concealed; head bulky and mailed; front gibbous; mouth large; short crowded teeth (*en velours ras*) in the jaws and palatines, but none in the vomer; eight rays in the branchiæ. But one species is known; the

Mon. japonica, Bl. Schn. pl. xxiv; *Lépisacanthe japonais*, Lacep. Six inches long, of a silvery white. From the sea of Japan.(4)

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(1) It is the *Blennius torvus* of Gronov., Act. Helvet. VII, pl. iii, copied, Walb., III, pl. 2, f. 1; or *Coryphæna torva*, Bl. Schn., and some new species.

(2) *Pel. obscurum*, Cuv., or *Scorpæna didactyla*, Pall. Spic. Zool. VII, xxvi, iv; Seb., III, xxviii, 3, or *Trigla rubicunda*, Hornstedt, Stokhol. Mem., IX, iii, and some new species to be described in our 4th vol.

(3) *Scorpæna horrida*, L., Lacep., II, xvii, 2; and not so well, Bl., 183;—the *Sc. brachion*, Lacép. III, xii, 1, or *Synanceia verrucosa*, Bl., Schn., pl. 45;—*Syn. bicapillata*, Lacép II, xi, 3.

(4) *Gasterosteus japonicus*, Houtt., Harl. Mem., XX, part II, 299, or *Sciæna japonica*, Thunb., New Stockh. Mem., XI, iii, copied Bl., Schn., pl. xxiv.

GASTEROSTEUS, Cuv.(1)

The cheek mailed, although the head is neither tuberculous nor spinous, as is the case in the preceding genera. Their peculiar character consists in the freedom of the dorsal spines, which do not form a fin, and in the pelvis being united to humerals larger than usual, and thus furnishing the abdomen with a sort of bony hauberk. Their ventrals, placed farther back than the pectorals, are nearly reduced to a single spine; there are but three rays to the branchiæ.

Some of them abound in the fresh waters of Europe.

Two species are confounded under the name of Stickleback,—*Gasterosteus aculeatus*, L.; which have three free dorsal spines; but the entire side of one of them, *G. trachurus*, Cuv. Bl., pl. 53, f. 3, is covered with scaly plates to the very end of the tail. These plates are only found in the other, *G. gymnurus*, Cuv. Willughb., 341, on the pectoral region. Both these species are sometimes so abundant in certain rivers in England and the north of Europe, that they are used to manure the land, feed hogs, &c.(2)

G. pungitius, L.; Bl., 53, 4, is the smallest of the European fresh water fishes; nine very short spines on the back; sides of the tail with carinated scales; another closely allied species inhabits the same streams, *G. lævis*, Cuv., in which this armature is wanting. A separate subgenus might be made of the

G. spinochia, L.; Bl., 53, 1, a salt water species of an elongated and slender form, with fifteen short dorsal spines, and the entire lateral line covered with carinated scales. Its abdominal shield is divided in two; and, besides the spine, there are two small rays in the ventral.

After this family we place the

OREOSOMA, Cuv.

A small oval fish, whose whole body, above and beneath, is studded with thick cones of a heavy substance. There are four of them on the back, and ten on the belly, arranged in two series, with smaller intermediate ones. It was discovered in the Atlantic, by Péron.(1)

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(1) N.B. This name, which signifies bony belly, is only applicable to the Gasterostei as we have defined them, and not to several of the Scomberoides, united with them by Linnæus on account of their dorsal spines being free: these latter we refer to our LICHIA.

(2) Neighbouring species or three-spined Sticklebacks: *G. argyropomus*, Cuv.; —*G. brachycentrus*, Cuv.;—*G. tetracanthus*, Cuv., three Italian species;—*G. noveboracensis*, Cuv.;—*G. niger*, Cuv., or *biculeatus*, Mitchill, Ann. New York Lyc., I, 1, 10;—*G. quadratus*, Id., Ib., f. 11;—*G. cataphractus*, Tiles. Mem. Acad. Petersb., III, viii, 1.

FAMILY III.

SCIENOIDES.

This family is closely related to the Percoides, and even presents nearly similar combinations of external characters, particularly in the indentations of the preoperculum, and in the spines of the operculum; but both vomer and palatines are without teeth; the bones of the cranium and face are generally cavernous and form a muzzle more or less gibbous. The vertical fins are frequently somewhat scaly.

Some of the Scienoides have two dorsals, and others have but one; among the former we first find the genus,

SCIÆNA,

Whose common characters consist of a gibbous head, supported by cavernous bones, two dorsals, or one deeply emarginate, whose soft part is much longer than the spinous; a short anal, a dentated preoperculum, an operculum terminating in points, and seven branchial rays. If it were not for the absence of the palatine teeth, these fishes would resemble the Perches. The entire head is scaly; their natatory bladder is frequently furnished with remarkable appendages, and the stones in the sac of the ear are larger than in most fishes.(2) We divide this genus as follows:

SCIÆNA, Cuv.

Spines of the anal, weak; neither canini nor cirri.

Sc. umbra, Cuv.; *Peisrey* of Languedoc; *Fegaro* of the Genoese; *Umbrina* of the Romans, &c. Six feet and more in length; numerous branched appendages on each side of the natatory bladder. A good fish, but it has latterly become rare on the coast of Europe.(1)

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(1) The fig. and detailed description will be found in our fourth vol. *Oreosoma*, a mountainous body.

(2) This determination of the genus Sciæna is in accordance with the opinion of Artedi; it has been variously modified by Linnæus and his successors, but in our opinion not very successfully.

Otolithus, Cuv.

Anal spines, as in the preceding, weak, and no cirri; some of the teeth are elongated hooks or true canini; the natatory bladder has a horn on each side which is directed forwards. They are found in America and India.(2)

Ancylodon.

A sort of Otolithus with a very short muzzle, excessively long canini and a pointed tail.(3)

Corvina, Cuv.

Neither canini nor cirri; all the teeth small and crowded. They also differ from the Sciænæ and the Otolithus in the size and strength of the second anal spine. One species is very abundant in the Mediterranean.

Sc. nigra, Gm.; *Corb noir;* Bl. 297. A silvery brown; ventrals and anal, black.(4)

Johnius, Bl.

The fishes of this subdivision are connected with those of the preceding one by a nearly uninterrupted series, the second anal spine is merely somewhat weaker and shorter than the subsequent soft rays. They are found in India where they form a considerable article of food; their flesh is white and light.(1) They are also met with in Senegal,(2) and in America.(3)

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(1) Artedi having confounded it with the *Sciæna nigra*, it is only latterly that it has been again determined. See my Memoir upon this Fish in the Mém. du Mus. tome I, p. 1;—Add the *Maigre du Cap*, or *Labre hololépidote*, Lacép. III, xxi, 2;—the *Maigre brulé*, which is the *Perca ocellata*, L., or *Centropome œillé*, Lacép., the *Sciæna imberbis* of Mitchill, and the *Lutjan triangle*, Lacep., III, xxiv, 3.

(2) *Ot. ruber*, Cuv., or the *Pêche pierre* of Pondichery; *Johnius ruber*, Bl., Schn., p. 17;—*Ot. versicolor*, Cuv., Russel, II, cix;—*Ot. regalis*, Cuv., *Johnius regalis*, Bl., Schn., or *Labrus squeteague*, Mitchill, Ann. New York Lyc. I, ii, 6;—*Ot. rhomboïdalis*, or *Lutjan de Cayenne*, Lacép., IV, p. 245;—*Ot. striatus*, Cuv., or *Guatucupa*, Marcgr., Braz., 177, and several others described in our fifth vol.

(3) *Lonchurus ancylodon*, Bl., Schn., XXV.

(4) Add, *Corv. miles*, Cuv., or *Tella katchelee*, Russ. 117;—*C. trispinosa*, Cuv., or *Bodianus stellifer*, Bl. 331, 1;—*C. oscula*, Lesueur, Ac. Nat. Sc. Phil. Nov. 1822;—*Bola cuja*, Buchan. pl. xii, f. 27;—*C. furcræa*, Cuv., Lacep., IV, p. 424; and *Bola coïtor*, Buchan. XXVII, 24;—*Bodianus argyroleucus*, Mitch. Ann. New York Lyc. I, vi, 3.

Umbrina, Cuv.

Distinguished from other Sciænæ by a cirrus under the symphysis of the lower jaw.

A beautiful species is taken in the Mediterranean,—*Sciæna cirrhosa*, L.; Bl. 300, obliquely streaked with steel-colour on a gold ground. It is a large and good fish, which has ten short cæca and a large natatory bladder furnished with some lateral, rounded sinuses.(4)

The **Lonchurus**, Bl., merely appears to differ from the Umbrinæ in a pointed caudal and two cirri on the symphysis.(5) The

Pogonias, Lacep.

Resembles an Umbrina, but instead of a single cirrus beneath the jaw, there are several.

One of them is found in America,—*Pog. fascé*, Lascep., II, xvi,(5) of a silver colour, when young marked with vertical brown bands, which becomes as large as the *Sc. umbra*, and like it, has branched appendages to the natatory bladder.(6) This fish produces a sound still more remarkable than any of the other Scienoides, which has been compared to that of several drums. Its pharyngeal bones are furnished with large teeth *en pavé*.(7)

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(1) The English of Bengal call it the *Whiting*.—*John. maculatus*, Bl., or *sarikulla*, Russ., 123;—*J. cataleus*, Cuv., Russ., 116, or *Bola chaptis*, Buchan. X, 25. It is the *Lutjan diacanthe*, Lacép. IV, 244;—*J. anei*, Bl. 357;—*J. karutta*, Bl.;—*J. pama*, Cuv., Buchan, XXXII, 26.

(2) *J. senegalensis*, Cuv., spec. nov.

(3) *J. humeralis*, Cuv., or *Labrus obliquus*, Mitchill, which also appears to be the *Perca undulata*, L.;—*J. Xanthurus*, or *Leiostome, queue jaune*, Lacép. IV, x, 1;—*J. saxatilis*, Bl., Schn.

(4) The *Cheilodiptère cyanoptère*, Lacép. III, xvi, 3, is merely a rudely drawn Umbrina. Add: *Umb. Russelii*, Cuv., Russel., 118;—*Sc. nebulosa*, Mitch., III, 5, which is also the *Perca alburnus*, L., Catesb., XII, 2;—*Kingfish* or *Whiting* of the United States;—the *Pogonathe doré*, Lacép., V, 122, also belongs to this subgenus.

(5) *Lonchurus barbatus*, Bl. 360.

(6) It is the *Labrus grunniens*, Mitch., III, 3; the *Sciæna fusca* and *gigas*, Id., appear to be the same species at a more advanced age, and every thing proves it to be also the *Labrus chromis*, L.; finally, the *Pogonathe courbine*, Lacép. V, 121, is the same. Add: *Umbrina Fournieri*, Desmar., Dict. Class. d'Hist. Nat.; its cirri are almost imperceptible.

(7) They are figured by Ant. de Jussieu, Mém. de l'Ac. des Sc., 1723, pl. xi.

Eques, Bl.

This genus cannot be removed from these Scienoides with two dorsals. It is known by the compressed and elongated body raised at the shoulders and ending in a point near the tail; teeth, small and crowded; the first dorsal is elevated, the second, long and scaly; they all belong to America.(1)

The Scienoides, with a single dorsal, are subdivided according to the number of their branchial rays.

Those which have seven form various genera parallel to several genera of the Percoides; their preoperculum is always dentated.

Hæmulon, Cuv.

A somewhat elongated profile, which has been thought to bear some resemblance to that of a hog; the lower jaw compressed and opening very wide; two pores and a little oval cavity under its symphysis; teeth, small and crowded. The parts of the lower jaw which enter the mouth when it is closed, are generally of a vivid red, from which circumstance their name is derived.(2) Their dorsal is slightly emarginate, and its soft part scaly; they are all from America.(3)

Pristipoma, Cuv.

The same preoperculum, and the same kind of pores under the symphysis as in Hæmulon, but the muzzle is more gibbous, the mouth not so deeply cleft, and the dorsal and anal are without scales. The operculum terminates in an obtuse angle concealed in its membranous edge. It is a very numerous genus, whose species are found throughout the hot parts of both oceans.(1)

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(1) *Eques balteatus*, Cuv., or *Eq. americanus*, Bl, 347, 1, or *Chætodon lanceolatus*, L., Edw., 210;—*Eq. punctatus*, Bl., Schn., III, 2; *Eq. acuminatus*, Cuv., *Grammistes acuminatus*, Bl. Schn. Seb., III, xxvii, 23.

(2) From αιμα, blood, and ὕλον, gum.

(3) *Hæm. elegans*, Cuv. or *Anthias formosus*, Bl., 323;—*Hæm. formosum*, Cuv., or *Perca formosa*, L., which is not the same as the preceding one, Catesb., II, vi, 1; but it is the *Labre Plumiérien*, Lacép., III, ii, 2; and the *Guaibi coara* of Marcgr., p. 163, the fig. of which is transferred to the *capeuna*, p. 185;—*Hæm. heterodon*, or *Diabase rayée*, Desmar., Dict. Class. d'Hist. Nat.;—*Hæm. caudimacula*, Cuv., or *Uribaco*, Marcgr., 177; and *Diabase de Parra*, Desm., loc. cit.;—*Hæm. capeuna*, or *Capeuna*, Marcgr., 155, and the fig., p. 163, of the *Guaibi coara*. It is the *Grammist. trivittatus*, Bl., Schn., 188;—*Hæm. chrysopterum*, Cuv., or *Perca chrysoptera*, L., Catesb., II, ii, 1, and several other species described in our fifth vol.

DIAGRAMMA, Cuv.

The cavity of the symphysis wanting, but the two small anterior pores still remain; besides which, there are two larger ones beneath each branch. In every thing else, the jaws, opercula and fins are like those of Pristipoma. They are found in both oceans: those of the Atlantic have the largest scales.(2)

Those of India are the most numerous and have smaller scales, a more convex front and a very short muzzle.(3)

The Scienoides with a single dorsal and less than seven branchial rays, are still more subdivided: in some of them the lateral line extends to the caudal; in others it is interrupted. Among the former we place the following genera:

LOBOTES, Cuv.

A short muzzle; lower jaw prominent; body elevated; the posterior angle of its dorsal and anal so elongated, that with the rounded caudal, it appears to terminate in three lobes. Four groups of extremely small points are visible near the end of the jaw; they inhabit both oceans.(4)

CHEILODACTYLUS, Lacep.

Body oblong; mouth, small; numerous spiny rays in the dorsal;

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(1) *Pr. hasta*, Cuv., *Lutjanus hasta*, Bl., 246, 1;—*Pr. nageb.*, Cuv.; *Sciæna nageb*, Forsk, or *Labre Commersonien*, Lacép., III, xxiii, 1: and *Lutjan microstome*, Ib., XXXIV, 2;—*Pr. guoraca*, Cuv., Russel, 132, or *Perca grunniens*, Forsk., or *Anthias grunniens*, Bl., Schn., p. 305;—*Pr. Paikulli*, Cuv., Russel, 121:—*Pr. caripa*, Id., 124, of which the *Anth. maculatus*, Bl., 326, 2, appears to be a variety;—*Pr. coro*, Cuv., Seb, III, xxvii, 14, or *Sciæna coro*, Bl., 307, 2;—*Lutj. surinamensis*, Bl., 253;—*Sparus virginicus*, L, of which *Perca juba*, Bl. 308, 2: and *Sparus vittatus*, Bl, 263, are the young;—*Coius nandus*, Buchan, XXX, 32.

(2) We know but one of them, of which the *Lutjanus luteus*, Bl. 247, appears to be a bad figure.

(3) It is to them that the PLECTORYNQUE, Lacép., I, xiii, 2, must be referred. Add the *Sciæna gaterina*, Forsk.:—*Sc. shotaf*, Id.:—*Diagr. lineatum*, Cuv., or *Perca diagramma*, L., Seb., III, xxvii, 18, or *Anthias diagramma*, Bl., 320;—*Diag. pœcilopterum*, Cuv., Seb., III, xxvii, 17:—*D. pictum*, Cuv., Seb. III, xxvi, 32, or *Perca picta*, Thunb. New Stockh. Mem., XIII, v;—*D. pertusum*, or *Perca pertusa*, Id., Ib., XIV, vii, 1.

(4) *Holocentrus surinamensis*, Bl., 243, or *Bodianus triurus*, Mitch. III, f. 10, and new species.

inferior rays of the pectorals simple and continued beyond the membrane, as in the Cirrhites.(1)

SCOLOPSIDES, Cuv.

The second infra-orbital dentated and terminating near the edge of the orbit in a point directed backwards, which crosses another point of the third infra-orbital running in a contrary direction. The body is oblong, the mouth but slightly cleft, the teeth small and crowded, and the scales large. There are no pores in the jaws. From the Indian ocean.(2)

MICROPTERUS, Lacep.

Body oblong; three pores on each side of the symphysis; the last rays of the soft part of the dorsal separated from the others and forming a small particular fin; operculum entire.(3)

Those Scienoides which have less than seven branchial rays and an interrupted lateral line, form several genera of small, oval fishes, prettily coloured, which may be distinguished as follows by the armature of their head. They are manifestly related to the genus Chætodon, and resemble, externally, several of our fishes with labyrinthian branchiæ.

AMPHIPRION, Bl. Schn.(4)

The preoperculum and the three opercular pieces dentated, the latter even furrowed; a single range of obtuse teeth.(5)

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(1) The *Cheilod. fascé*, Lacep., V, i, 1, or *Cynædus*, Gronov., Zoophyl., I, x, 1;—the *Cheil. of Carmichael*, or *Chætodon monodactylus*, Id., Lin. Trans. XII, xxiv;—*Cheil. carponemus*, Cuv., or *Cichla macroptera*,, Bl., Schn., 342;—*Cheil. zonatus*, Cuv., or *Labrus japonicus*, Tiles., Voy. Krusenst. pl. lxiii, f. 1.

(2) *Scol. kate*, Cuv. named by Bloch *Anthias japonicus*, 325, f. 2;—*Anth. Vosmeri*, Bl., 321, a poor figure, and the same as the *Perca aurata*, Mungo Park, Lin. Trans. III, 35;—*Anth. bilineatus*, Bl. 325, 1;—*Scol. kurita*, Cuv. Russel., 106;—*Scol. lycogenis*, Cuv., or *Holoc. cilié*, Lacép., IV, 371;—*Sciæna ghanam*, Forsk, and several new species.

(3) But one species is known, the *Microptère Dolomieu*, Lacép., IV, iii, 3. We have also some few more subgenera of this subdivision, which we shall speak of in our 5th vol.

(4) I greatly reduce the number of species of this genus, as composed by Bloch.

(5) *Amph. ephippium*, Bl., 250, 2;—*Amph. bifasciatus*, Bl., 316, 2;—*Amph. polymnus*, Bl., 316, 1;—*percula*, Cuv., or *Lutj. perchot*, Lacep., IV, 239, Klein., Misc., IV, xi, 8;—*Amph. leucurus*, Cuv., Renard, VI, 49, and various new species.

PREMNAS, Cuv.

One or two stout spines on the infra-orbital, and the preoperculum dentated.(1)

POMACENTRUS, Lacep.(2)

Preoperculum dentated, operculum unarmed; a single range of trenchant teeth.(3)

DASCYLLUS, Cuv.

The fishes of this genus only differ from those of the preceding one in their teeth, which are very short and crowded (*en velours ras*).(4) They all inhabit the Indian ocean.

GLYPHISODON, Lacep.

Operculum and preoperculum entire; a single range of trenchant and generally emarginated teeth.

They are found in the Atlantic,(5) but the Indian ocean produces many more.(6)

Some of them are distinguished from the others by numerous spines in the anal.(7)

HELIASUS.

The opercular pieces of the Glyphisodon and teeth similar to those of a Dascyllus, that is, small and crowded. They are found in both oceans.(1)

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(1) *Chætodon biaculeatus*, Bl., 219, 2, which is also the *Holocentre Sonnerat*, Lacép., IV, 391; and the *Lutj. trifasciatus*, Bl., Schn., 567; and Kæhlreuter, Nov. Com. Petrop., X, viii, 6; Seb., III, xxvi, 29, is a variety of it;—*Pr. unicolor*, Cuv., Seb. III, xxvi, 19, which is also the *Scorpène aiguillonnée*, Lacép. III, 268.

(2) We define them differently from Lacépède, and greatly diminish their number by divisions.

(3) *Chætodon pavo*, Bl., 198, 1, which is the *Pomacentre paon*, Lacép., and his *Holoc. diacanthe*, IV, 338;—*Pomacentrus*, Quoy et Gaym., Voy. Freycin., pl. 64, f. 2;—*P. punctatus*, Ib., 1;—*P. emarginatus*, Seb. III, xxvi, 26, 27, 28;—the *Hol. negrillon*, Lacép. IV, 367.

(4) *Chætodon aruanus*, L., Mus. Ad. Fred. XXXII, Bl., pl. 198, f. 2.

(5) The *Jacaraqua*, Marcgr., or *Chætod. saxatilis*, L., Mus. Ad. Fred., XXVII, 3, which is also the *Chæt. marginatus*, Bl., 207; and his *Ch. mauritii*, 213, 1; and the *Ch. sargoïde*, Lac.; but it is not the *Ch. saxatilis*, Bl., 206, 2;—*Ch. curassao*, Bl., 212.

(6) *Chætod. bengalensis*, Bl. 213, 2, or *Labre macrogastère*, Lacép., III, xix, 3;—*Gl. melanurus*, Cuv., or *Labre 6-bandes*, Lacép., III, xix, 2;—*Chæt. sordidus*, Forsk., or *Calamoia pota*, Russel., 85;—*Gl. sparoïdes*, Cuv., Lacép., IV, ii, 1;—*Gl. lachrymatus*, Cuv., Quoy et Gaym., Freycin., pl. 62, f. 7;—*Gl. azureus*, Ib., pl. 64, f. 3;—*Gl. uniocellatus*, Ib., f. 4.

(7) *Chætod. suratensis*, Bl. 217;—*Chætod. maculatus*, Bl., 427.

FAMILY IV.

SPAROIDES.

The Sparoides, like the Scienoides, have a palate destitute of teeth. Their general figure and several details of their organization are the same; they are also covered with scales more or less large, but they have none on the fins. Their muzzle is not gibbous, nor the bones of their head cavernous; there are neither indentations in their preoperculum, nor spines on their operculum; their pylorus is furnished with cæcal appendages. They never have more than six rays in the branchiæ. They are divided according to the form of their teeth.

In the first tribe, that of SPARUS, Cuv. the sides of the jaws are furnished with round molars *en paves;* we subdivide it into five genera.

SARGUS, Cuv.

Trenchant incisors in front of the jaws almost similar to those of Man.

Several of them which differ but little from each other inhabit the Mediterranean, and are even found in the gulf of Gascony. They are marked with vertical, black bands on a silver ground.(2)

Some have emarginated incisors.(3)

The round molars of others are on a single line and very small. From the Mediterranean.(4)

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(1) The species are new; we describe them in our 5th vol.

(2) The *Sargue de Rondelet* (*Sargus raucus*, Geoff.), Eg., Poiss., pl. xviii, 1, Rondelet, 122. *Sp. pantazzo*, Risso;—the *Sargue de Salviani* (*Sargus vulgaris*, G.), Eg., XVIII, 2; *Salviani*, fol.179, Pisc. 64;—the *Sparaillon*, (*Sargus annularis*, L.), Rondel., 118; Salv., 63; Laroche, Ann. Mus. XIII, pl. xxiv, f. 13;—*Sp. ovis*, Mitch., or *Sheephead* of the United States.

(3) *Perca unimaculata*, Bl., 308, 1, or *Salema*, Marcgr., 153;—*Sparus crenidens*, Forsk., probably belongs to this subdivision.

(4) *S. puntazzo*, Gm., or *Sp. acutirostris*, La Roche, Ann. Mus. XIII, xxiv, 12, of which Risso makes his genus CHARAX.

CHRYSOPHRIS, CUV.

Round molars on the sides of the jaw, forming at least three rows on the upper one; a few conical or blunt teeth in front. Two species inhabit the European seas.

***Chr. auratus; Sparus aurata*, L. Bl., 266,(1) and much better, Duham., Sect. IV, pl. 2. Four rows of teeth above; five below, one of which is oval and much larger than the others: a large and excellent fish called *Chrysophris*—golden eye-brow—by the ancients, on account of a crescent-shaped band of a golden hue which extends from one eye to the other.**

***Chr. microdon*, Cuv. Colours nearly the same as in the aurata; smaller; the forehead more gibbous; only two rows of molars below, all of which are as broad as they are long, or broader; the large oval one is wanting.(2)**

PAGRUS

Differs from Chrysophris in having but two rows of small rounded molar teeth in each jaw; the front teeth either resemble those of a card or are small and crowded.

***Pagr. vulgaris; Sparus pagrus*, L. and Arted. Silvery, with a reddish gloss; no black spot. The Mediterranean.(3)**

The Indian Ocean and the coast of the United States produce some of these fishes, whose first dorsal spines are prolonged into filaments.(4)

Others taken at the Antilles are remarkable for the first interspinal of their anal fin, which is hollow and terminates en bec like a pen; the point of the natatory bladder runs into this kind of funnel. They are called *Sardes à plumes*.(5)

A more remarkable peculiarity is that of a Cape Pagrus, whose maxillaries are enlarged and as solid as stone. We call it *Pagrus lithognathus*.

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(1) The teeth belong to another species, and those of the true *Chr. aurata* are figured pl. 74, as appertaining to the Anarrhichas.

(2) Add: *Sparus bufonites*, Lacép., IV, xxvi, 2, the same as his *Sp. perroquet*, Ib., 3; and perhaps as the *Sp. haffara*, Forsk., 33;—*Sp. sarba*, Forsk., 22;—*Chr. chrysargyra*, Cuv., *Chitchillee*, Russel, 91;—*Sp. hasta*, Bl., Schn., 275, or *Sp. berda*, Forsk. 33;—*Sp. calamara*, Cuv., Russ. 92;—*Sciæna grandoculis*, Forsk., 53;—*Chætodon bifasciatus*, Forsk., which is also the *Labre chapelet*, Lacép., III, iii, 3, his *Spare mylio*, Ib., XXVI, 2, and his *Holocentre rabagi*, IV, Suppl., 725, &c.

(3) It is also the *Sp. pagrus* of Brunnich, but not that of Bloch; the latter has not figured the true Pagrus, which is the *Sp. argenteus* of his posthumous "System."

(4) *Sparus spinifer*, Forsk.;—*Sp. argyrops*, L., or *Labrus versicolor*, Mitch.

(5) *Pagr. calamus* and *Pagr. penna*, Cuv.

PAGELUS, CUV.

Teeth very like those of the preceding genus; but the molars, also in two rows, are smaller; the front conical ones are slender and more numerous. A more elongated muzzle gives a very different physiognomy to this genus. Several species are found in the European seas.

Pag. erythrinus; Sparus erythrinus, L.; Bl. 274. A fine fish of a silver colour with a pale rose gloss; body high and compressed.

Pag. centrodontus; Sp. centrodont., Laroche; the *Rousseau* at Marseilles; *Besugo* of the Spaniards; Ann. Mus. XIII, xxiii, 2. Silvery, glossed with rose; a large, irregular black spot on the shoulder.(1)

Pag. acarne, Cuv., the *Acarne;* Rondel., 511; *Sparus berda* of Risso, but not of Forskhal. Smaller and more oblong; silvery, tinged with greenish towards the back; no black spot.

Pag. bogaraveo; Sp. bogar., Gm.; Rondel., 137. More oblong; muzzle more pointed; gilt tinged with violet; a black spot on the axilla.

Pag. mormyrus; Sp. mormyrus, L.; Rondel., 153; Geoff., Eg. Poiss. pl. xviii, 3. Vertical black bands on a silver ground.

In the second tribe there is but one genus,

DENTEX, CUV.

Characterized by conical teeth even on the sides of the jaws, generally in one range, some of the anterior of which are drawn out into large hooks. They would be rather closely allied to the genus Hæmulon were it not that the indentation of the preoperculum is wanting, and that they have one ray less in their branchiæ. The cheek is scaly. Two species are found in the Mediterranean.

D. vulgaris; Sparus dentex, L.; *Dentale* of the Italians; Bl., 268. Silvery, shaded with bluish, towards the back; sometimes three feet in length.(2)

D. macropthalmus; Sp. macropth., Bl., 272. Red, with very large eyes; much rarer than the preceding, and about half its size.

We distinguish from the other species of Dentex, by the name of Pentapoda, those whose mouth is less cleft, head more scaly, body less elevated, and whose caudal is covered with scales to the end.(1)

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(1) It is the *Sparus pagrus*, Bl., pl. 262.

(2) Add: *D. macrocephalus*, Cuv., or *Labre macrocephale*, Lacép., III, xxvi, 1;—*Sparus cynodon*, Bl., 278;—*Dentex hexodon*, Quoy et Gaym. Voy. Freycin., 301.

By that of Lethrinus, we distinguish such as have no scales on the cheek; most of them, as in Hæmulon, have some red about the angle of the jaws.(2) All these fishes have a pointed scale between the ventrals, and one above each of them.

A third tribe is also composed of a single genus.

CANTHARUS, CUV.

Teeth short and crowded, or bent and crowded (*en cardes serrées*), all round the jaws; those of the external row being the strongest; body elevated and thick; muzzle short; jaws not protractile. Two species are found in the Atlantic and Mediterranean.

Canth. vulgaris; Sparus canth., L.; Rond. 120, and Duham. sect. iv, pl. iv, f. 1. Silver-grey, longitudinally striped with brown; some small rough teeth behind the bent ones.

Canth. brama; *Sparus brama*, L. About the same colour; all the teeth bent.(3)

In a fourth tribe the teeth are trenchant. It comprises two genera.

BOOPS, CUV.

Teeth of the external row trenchant, mouth small and nowise protractile. Several species are found in the Mediterranean.

B. vulgaris; Sparus boops, L.; Rond. 136. Twenty-four teeth in each jaw, with an oblique, cutting edge; the body oblong, with longitudinal gold-coloured stripes, on a silver ground.

B. salpa; Sparus salpa, L.; Bl., 265. More oval; stripes of a more brilliant gold, on a ground of burnished steel; teeth broad and emarginated.

OBLADA, CUV.

Differs from Boops in having small crowded teeth behind the incisors, which somewhat approximates this genus to Cantharus.

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(1) *Sparus vittatus*, Bl. 275;—the *Sp. rayé d'or*, Lacép., IV, 131, and some new species.

(2) *Spar. chærorhynchus*, Bl., Schn., 278;—*Bodian lutjan*, Lacep., IV, 294;—*Kurwa*, Russel, 89;—*Sciæna mahsena*, Forsk., p. 52, No. 62;—*Sciæna harak*, Id.

(3) The fig. of Bloch, 269 and 270, intended to represent these two species, convey no correct idea of them.

Ob. melanurus; sparus melanurus, L.; Salv. 181. Silvery, striped with blackish; a broad black spot each side of the tail.

FAMILY V.

MENIDES.

The Menides differ from the preceding families in the extreme extensibility and retractility of their upper jaw, which is owing to the length of the intermaxillary pedicles which withdraw between the orbits. Their body is scaly, as in Sparus, in which genus they have hitherto been placed.

MÆNA, Cuv.

Distinguished from a true Sparus by having very short, small, and crowded teeth, in a narrow and longitudinal band on the vomer. Those also in the jaws are all extremely fine, forming a very narrow band. The body is oblong, compressed, and somewhat similar to that of a Herring; an elongated scale above each of the ventrals, and another between them. Several species inhabit the Mediterranean.

M. vulgaris; Sparus mæna, L.; Bl. 270. Back, lead-colour; belly, silvery; a black spot on the flank opposite the last spine of the dorsal.

M. jusculum, Cuv., only differs from the vulgaris in having a narrower body, a shorter muzzle and a higher dorsal.

M. radiata; Sparus radiatus, Osbeck.; *Sp. tricuspidatus*, Spinola; Ann. Mus. X, pl. xviii. A deep steel-blue; oblique blue streaks on the cheek; blue spots on the ventrals; the dorsal still higher.

SMARIS, Cuv.

The fishes of this genus only differ from the Mænæ in the total deficiency of teeth in the vomer; their body is generally somewhat less elevated. Some of them are found in the Mediterranean.

S. vulgaris; Sparus smaris, L.; *Le Picarel commun;* Laroche, Ann. Mus. XIII, pl. xxv, f. 17. Lead-grey above; silvery beneath; a black spot on the flank.

S. alcedo, Riss., so called from the beautiful blue with which its body is variegated.

S. cagarella, Cuv. The body as high as that of the Mæna vulgaris, from which it only differs in having no palatine teeth.

CÆSIO, Lacep.

Only differs from Smaris in a dorsal somewhat higher in front, and surrounded at its base with fine scales. They inhabit the Indian ocean, and are shaped like a spindle.(1)

GERRES, Cuv.—*Mocharra*, in South America.

The mouth protractile, but when advancing, it descends; the body is elevated, the anterior part of the dorsal in particular, along the base of whose posterior portion is a scaly sheath. They have no other teeth than those in the jaws, which are small and crowded. The first interspinal of their anal fin is tabular as in certain Pagri. They are excellent food, and inhabit the hot parts of both oceans.(2)

G. rhombeus, Cuv.; Sloane, II, pl. 253, f. 1. A species that is said to penetrate occasionally as far as the coast of Cornwall, following pieces of wood covered with Anatifæ, carried there by the currents.(3)

FAMILY VI.

SQUAMIPENNES.

So called, because the soft, and frequently the spinous parts of their dorsal and anal fins are covered with scales, which encrust them, as it were, and render it difficult to distinguish them from the mass of the body. This is the most remarkable character of these fishes, the body of which is generally much compressed, the intestines long, and the cæca numerous. They were comprised by Linnæus in the genus

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(1) *Cæsio azuror*, Lacep., III, 86, or *Vackum*, Valent., 132, or *Canthère douteux*, Dict. Class. d'Hist. Nat. livr. IV;—*C. smaris*, Cuv., or *Vackum mare*, Renard, I, pl. 32, f. 174;—*Bodianus argenteus*, Bl., 231, or *Picarel raillard*, Quoy et Gaym., Zool. Freycin. pl. 44, f. 3;—*Sparus cuning*, Bl., 263, or *Cychla cuning*, Bl. Schn., p. 336.

N.B. M. de Lacépède also makes a *Cæsio* of the *Scomber equula* of Forskal, or *Centrogaster equula* of Gmelin, which is our *Equula caballa*.

(2) *Labrus oyena*, Forsk., Rupp. Voy. Poiss., pl. III, x, 2, or *Spare breton*, Lacép. IV, 134, or *Labre long museau*, Id. III, xix, 1, and p. 467;—*Gerres aprion*, Cuv., Catesb., II, xi, 2;—*G. rhombeus*, Cuv., or *Stone-bass*, Sloane, Jam., II, pl. 253, f. 1;—*G. poieti*, Cuv., Ren., pl. ii, f. 9, Valent., No. 354;—*G. lineatus*, Cuv., or *Smaris lineatus*, Humb., Zool. Obs. pl. xlvi, f. 2;—*Gerres argyreus*, Cuv., or *Sciæna argyrea*, Forster, or *Cychla argyrea*, Bl., Schn..;—*G. filamentosus*, Cuv., or *Wordawahah*, Russ., f. 68.

(3) Couch, Lin. Trans., XIV, part. I, p. 81

Chætodon, Lin.

So named from their teeth, which in length and tenuity resemble hairs, collected in several close rows like a brush. Their mouth is small; their dorsal and anal fins are so completely covered with scales similar to those on the back, that it is extremely difficult to ascertain where they commence. These fishes are very abundant in the seas of hot climates, and are adorned with the most beautiful colours, circumstances which have caused many to be figured, and rendered them common in our cabinets. Their intestines are long and ample, and their cæca long, slender and numerous; their natatory bladder is large and very strong. They frequent rocky shores, and are eaten.

Chætodon, *properly so called.*

The body more or less elliptical; the spinous and soft rays continuing in a uniform curve; the snout projecting more or less, and sometimes a very small indentation in the preoperculum. They have a mutual resemblance, even in the distribution of colours, most of them, for instance, being marked with a vertical black band, in which is placed the eye.

In some there are several other vertical bands parallel to the former.(1) In others they are oblique or longitudinal.(2)

The flanks of some are sprinkled with brown spots.(3)

Others again are merely marked with lines of reflections in various directions; here it is merely the ocular band;(4) and there, in addition, are ribands on the vertical fins.(5)

One or two ocellated spots are observed in some.(6)

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(1) *Chæt. striatus*, L., Bl. 205, f. 1;—*Ch. octofasciatus*, Gm., Bl., 215;—*H. collare*, Bl., 216.

(2) *Chæt. Meyeri*, Bl., Schn., improperly called *Holocanthe jaune et noir* by Lacép., IV, xiii, 2.

(3) *Chæt. miliaris*, Cuv., Zool. Voy. Freycin., pl. 62, f. 5.

(4) *Chæt. Kleinii*, Bl., 218, 2;—*Ch. Sebæ*, Cuv., Seb., III, xxvi, 36.

(5) *Chæt. vittatus*, Bl., Schn., Seb., III, xxix, 18;—*Ch. vagabundus*, Bl., 204;—*Ch. decussatus*, Cuv., Buss., 83; and Klein, Mis., IV, ix, 2;—*Ch. bifascialis*, Cuv., Voy. de Freycin., pl. 62, f. 5;—*Ch. strigangulus*, Gm.;—*Ch. baronessa*, Cuv., Renard, I, xliii, 218;—*Ch. frontalis*, Cuv., or *Pomacentre croissant*, Lacép.;—*Ch. fasciatus*, Forsk., or *Ch. flavus*, Bl., Schn., No. 37.

(6) *Ch. nasogallicus*, Cuv., Ren., I, v, 37; and Will., App., V, 4;—*Ch. capistratus*, L., Seb., III, xxv, 16, Mus. Ad. Fred., XXXIII, 4; Klein., Misc., IV, xi,

Some of these Chætodons, properly so styled, are distinguished from the others by a filament formed by the prolongation of one, or several of the soft rays of the dorsal.(1)

Finally, some are remarkable for the very small number of the spine of their dorsals.(2)

Chelmon, Cuv.

Separated from Chætodon on account of the extraordinary form of the snout, which is long and slender, only open at the extremity, and formed by a most excessive prolongation of the intermaxillary and lower jaw. Their teeth are very fine and crowded, (*en fin velours*) rather than like hairs.

One species, *Chæt. rostratus*, L., Bl., 202, has the faculty of spurting drops of water on the insects it perceives on the shore, and thus bringing them within reach. It is a common pastime of the Chinese at Java.(3)

Heniochus, Cuv.

Differs from the true Chætodon, because the first spines of the back, and particularly the third or fourth, rapidly increase in length, forming a filament sometimes double the length of the body, and resembling a kind of whip.(4)

Ephippus, Cuv.

Distinguished by a dorsal deeply emarginated between its spinous and soft portions; the spinous part, which has no scales, can be folded into a groove formed by the scales of the back.

In one of the subdivisions, there are three spines in the anal fin, and oval pectorals.

America produces a species (*Eph. gigas*, Cuv., remarkable for the great enlargement of the first interspinal of its dorsal

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5;—*Ch. bimaculatus*, Bl., 219, 1;—*Ch. plebeius*, Gm.;—*Ch. unimaculatus*, Bl., 201, 1;—*Ch. sebanus*, Cuv., Seb., III, xxv, 11;—*Ch. ocellatus*, Bl., 211, 2.

(1) *Chæt. setifer*, Bl., 426, 1;—*Ch. auriga*, Forsk.;—*Ch. principalis*, Cuv., Ren. part II, lvi, 239, Valent., No. 407.

(2) These species are new, as well as many others which belong to preceding subdivisions—they will be described in our Icthyology.

(3) Schlosser, Trans. Phil., 1767, p. 39.—Add: *Ch. longirostris*, Brousson, Dec. Icthyol.

(4) *Chætodon macrolepidotus*, L., Bl., 200, 1; the *Chæt. acuminatus*, L., Mus. Ad. Fred., XXXIII, f. 2, appears to be a mere individual variety of it;—the *Chæt. cornutus*, L., Bl., 200, 2, of which the *Chæt. canescens*, L., Seb., III, xxv, 7, is only a young uncoloured specimen.

and anal fins, which is clavate, and for a similar inflation of the crest of the cranium.(1)

In a second subdivision, from the Indian Ocean, there are three spines in the anal, and long and pointed pectorals.(2)

A third, also from the Indian Ocean, has four anal spines, and very small scales.

One species, *Chætodon argus*, L., Bl., 204, 1, has the reputation of feeding, de preference, upon human excrement.(3)

Another species of this same subdivision has been discovered in a fossil state in Mount Bolca.(4)

The TAURICHTES are *Ephippii* of India, which have an arcuated and pointed horn over each eye.(5)

HOLACANTHUS, Lacep.

A large spine at the angle of the preoperculum, and the edges of the same bone, in most species, dentated. Their flesh is excellent, and they are remarkable for the beauty of their colours, and the regularity with which they are distributed. Numerous species abound in both oceans.(6) Their form is oval or oblong; we may separate from them the

POMACANTHUS, Cuv.

In which the form is more elevated; a circumstance resulting from the more sudden rise of the edge of the dorsal.(7) The only species known are from America.

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(1) Add: *Chætodon faber*, Brousson., Bl., 212, 2, of which the *Chæt. Plumieri*, Id., 211, 1, may be a variety;—*Chæt. orbis*, Bl., 202, 2.

(2) *Chæt. punctatus*, L., or *Latté*, Russ., 79;—*Chæt. longimanus*, Bl., Schn., Russ., 80;—*Eph. terla*, Cuv. Russel, 81.

(3) Add, *Chæt. tetracanthus*, Lacép. III, xxv, 2.

(4) Ittiolitologia Veronese, pl. v, f. 2, where it is figured as the *Argus*, but it is a different species.

(5) The *Buffalo-fish* of the Malays, *Taurichthys varius*, Cuv., well figured by Ren. I, xxx, 164, Valent., No. 71;—*T. viridis*, Ren., II, x, 49, Valent., No. 161.

(6) American species, *Chæt. ciliaris*, L., Bl., 214, or *Isabelita*, Parra, VII, 1, or *Chæt. couronné*, Desmar., Dec. Icthyol.;—*Chæt. tricolor*, Bl., 425; Duham., Sect. IV, pl. xxiii, 5. India species, *Chæt. bicolor*, Bl., 206, 1;—*Ch. mesoleucos*, Bl., or *mesomelas*, Gm., Bl., 216, 2;—*Holac. amicalis*, Cuv., Ren. I, xvi, 92;—*Ch. annularis*, Bl., 215, 2;—*Ch. imperator*, Bl., 194;—*Ch. fasciatus*, Bl., 195;—*Ch. nicobariensis*, Bl., Schn., 50, or *Geometricus*, Lacép., IV, xiii, 1;—*Hol. Lamark*, Lacép., IV, 531, Renard, I, xxvi, 144, 145, and several new species.

(7) *Chæt. aureus*, Bl., 193, I, or *Chirivita jaune*, Parra, VI, 2;—*Chæt. paru*, Bl., 197, or *Chirivita noir*, Parr., VI, 1;—*Ch. 5-cinctus*, Cuv., *Guaperva*, Marcgr., 178;—*Ch. arcuatus*, L., Bl., 204, 2.

Platax.

A row of trenchant teeth, each divided into three points, in front of the others, or brush-like teeth; the body, strongly compressed, seems to be continued into thick, vertical, elevated and scaly fins, in whose anterior edge some few spines are concealed, so that the whole fish is much higher than it is long; very long ventrals. The Indian Ocean.(1)

> One species, *Ch. arthriticus*, Bell. Phil. Trans., 1793, pl. vi, of a more orbicular form, is remarkable for the knots or enlargements in some of its interspinals and spinous apophyses.(2)
>
> A fossil species of this subdivision has also been discovered at Mount Bolca.(3)

Psettus, Commers.

Figure similar to that of a Platax, but the teeth are very small and crowded, and the ventrals reduced to a single small spine, without soft rays.

The form of some is elevated;(4) that of others round or oval;(5) they are all from the Indian Ocean.

Pimelepterus, Lacep.

Distinguished from all other fishes by a single range of teeth placed in a horizontal base or heel, on the anterior edge of which is a part vertical and trenchant. The body is oblong, the head obtuse, and the fins thickened by the scales which cover them; from which circumstance their name is derived.(6) They are oval, smooth, and covered with brown scales; they inhabit both oceans.(7)

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(1) *Chæt. vespertilio*, Bl., 199, 2;—*Ch. teïra*, Ib., 1;—*Ch. guttulatus*, Cuv. Ren., II, xxiv, 129.

(2) It is also the *Ch. pentacanthe*, Lacep., IV, xi, 2, and the *Ch. orbicularis*, Forsk., or *Acanthinion orbiculaire*, Lacep. IV, 500.

(3) Ittiol. Veron., pl. 4 and 6.

(4) *Psett. Sebæ*, Cuv., *Chætodon rhombeus*, Bl., Schn., Seb., III, xxvi, 21;—*Ps. rhombeus*, Cuv., or *Scomber rhombeus*, Forsk., or *Centrogaster rhombeus*, Gm., or *Centropode rhomboïdal*, Lacép., Russ., 59.

(5) *Psett. Commersonii*, Cuv., or *Monodactyle falciforme*, Lacép., II, v, 4, and III, 131, which very probably does not differ from the *Chæt. argenteus*, L., or *Acanthopode argenté*, Lacép.

(6) *Pimelepterus* (fat fin). This genus of Lacépède, IV, 429, formed from Bosc, is the same as that of Xisteres, V, 484, formed from Commerson; and there is every reason to believe that the *Dorsuaire*, Lacép., V, 482, which is certainly identical with the Kyphose, III, 114, may very possibly also be the same as the Xisterus.

(7) The *Piméloptère bosquien*, Lacép. IV, ix, 1, or *Chætodon cyprinaceus*, Brous-

Dipterodon.(1)

A neighbouring genus, in which the teeth are also trenchant, but cut sloping and not geniculate; the spinous portion of the dorsal separated from the soft part by a deep emargination.

Dipt. capensis, Cuv., is the only species known.

The following genera, which we place next to Chætodon on account of their scaly fins, differ greatly from it, however, in the teeth with which their palatines and vomer are furnished. The genus

Brama, Bl. Schn.(2)

Is connected with this family by the scales covering the vertical fins, which have but a small number of spinous rays concealed in their anterior edges; but they have slender, bent teeth (*en cardes*) in the jaws and palatines, an elevated profile, very short snout, a forehead descending vertically, and a mouth, when shut, that is almost vertical; the scales extend on to the maxillaries; there are seven rays in the branchiæ; a dorsal and low anal, but commencing in a salient point; a short stomach; a small intestine and only five cæca.

But one species is known, *Sparus Raii*, Bl. 273; it inhabits the Mediterranean, and sometimes strays into the ocean; an excellent fish of a burnished steel colour which attains a large size, but is infested with various species of intestinal worms.

Pempheris, Cuv.

A long and scaly anal, the dorsal short and elevated; head obtuse; the eye large; a small spine on the operculum; small crowded teeth on the jaws, vomer and palatines. From the Indian Ocean.(3)

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sonet;—the *Pim. marciac*, Quoy et Gaym., Voy., Freycin., pl. 62, f. 4;—*Pim. du Cap*, or *Kiphose double bosse*, Lacep., III, viii, 1;—a Brazil species formerly named by Banks *Chætodon ensis*.

(1) This genus, the name of which is borrowed from Lacep., does not, however, contain the same species.

(2) I strongly suspect, that it is the Brama which M. Rafinesque has in view, in his *Lepodus saragus*, Nuov. Gen. No. 144. Shaw makes two species of it, but why, it is impossible to say, the *Sp. Raii*, and *Sp. castaneola;* the latter after Lacep.; but Lacep. made his genus only for the species of Bloch and Ray.

(3) *Pempheris touea*, Cuv., *Sparus argenteus*, J. White, App. 267, or *Kurtus argenteus*, Bl. Schn., 164;—*P. mangula*, Cuv., Russ., 114;—*P. molucca*, Cuv., Ren., I, xv, 85, and Valent., No. 46.

TOXOTES, Cuv.

The body short and compressed; the dorsal placed on the last half of the body, with very stout spines, the soft part, as well as that of the anal which corresponds to it, scaly; the snout depressed, short; lower jaw projecting beyond the upper one; the small crowded teeth very short in both jaws, the extremity of the vomer, palatines, pterygoids, and on the tongue; six rays in the branchiæ, inferior edge of the infra-orbital and preoperculum, finely serrate. Their stomach is wide and short, with twelve cæcal appendages to the pylorus; natatory bladder, large and thin.

The species known, *Toxotes jaculator*, Cuv.; *Labrus jaculator*, Shaw, vol. IV, part II, p. 485, pl. 68,(1) is celebrated for the same faculty that distinguishes the *Chæt. rostratus*. By spurting drops of water on insects which frequent aquatic plants, they are beaten down and brought within its reach. It can force the water to a height of three or four feet, and rarely misses its aim.

FAMILY VII.

SCOMBEROIDES.

Our seventh family is composed of a multitude of fishes with small scales, a smooth body, numerous cæca frequently united in clusters, and whose tail and caudal fin in particular are extremely powerful.

This family is of the greatest utility to man, by the size and flavour of its species, and their inexhaustible reproduction which brings them periodically into the same latitudes, where they constitute the object of the most extensive fisheries.

SCOMBER, Lin.

The first dorsal entire, while, on the contrary, the last rays of the second, as well as those of the anal which correspond to them, are detached, forming what are termed false or spurious fins, or *pinnæ spuriæ*. The genus is subdivided as follows:

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(1) It is also the *Scarus Schlosseri*, Gm., Lacép. and Shaw, the *Sciæna jaculatrix* of Bonnaterre, the *Labre sagittaire* of Lacép., and the *Coïus chatareus* of Buchanan.

SCOMBER, Cuv.

The Mackerels have a fusiform body covered with uniformly small and smooth scales; two little cutaneous crests on the sides of the tail; an empty space between the first and second dorsal.

Sc. scombrus, L., Bl. 54. (The Common Mackerel.) Blue back, varied with black undulating streaks; five false fins above and beneath. The value, &c. of this fish is too well known to need a comment. The Common Mackerel has no natatory bladder; but, and it is a singular fact, that organ is found in several other species, so similar to it, that some attention is necessary to distinguish them; such are the little *Mediterranean Mackerel*, *Sc. colias; Sc. pneumatophorus*, Laroche, Ann. Mus., XIII; and the *Sc. grex*, Mitch., Ann. New York Lyc., I, 423, which is sometimes seen on the coast of the United States, in countless numbers, &c. (1)

THYNNUS, Cuv.

A soft corslet round the thorax, formed by scales larger and smoother than those on the rest of the body; a cartilaginous carina between the two little crests on the sides of the tail; the first dorsal extends close to the second.

Sc. thynnus, L. (The Tunny.) This fish has been taken in the Mediterranean, from a very ancient date, and by its abundance constitutes a great source of wealth to Provence, Sardinia, Sicily, &c. It is said to attain the length of fifteen and eighteen feet, and has nine spurious fins above, and as many beneath; the pectorals are one-fifth of its whole length. Several neighbouring species inhabit the Mediterranean, that have hitherto been but badly distinguished.

Sc. brachypterus, Cuv.; the *Alicorti*, Rondel., 245, and Duham., Sect. VII, pl. vii, f. 5. Pectorals but one-eighth of the whole length.

Sc. thunina, Cuv.; *La Tonine;* Aldrov., 315; Descrip. de l'Eg. Poiss. pl. xxiv, f. 5. A brilliant blue marked with black lines, undulated and curved in various ways, &c. It is also in this first group that we must place the

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(1) Add, *Scomber vernalis*, Mitch, loc. cit.;—*Sc. canagurta*, Cuv., Russ., 136.

Sc. pelamys, L., Lacep., II, xx, 2. (The Bonita.) Four longitudinal blackish bands on each side of the belly.(1) The

Orcynus, Cuv.

Only differs from the Tunnies in the extremely extended pectorals, which are one-third of the entire length, and reach beyond the anus.

Sc. alalonga, Gm.; *Germon* of the Biscayans; *Alalonga* of the Italians; Duham., Sect. VII, pl. vi, f. 1, under the improper name of Tunny; Willughb. App. pl. x, f. 1, is taken in the Mediterranean, with the Tunny, and in summer visits the gulf of Gascogny, in numerous bodies, where it constitutes an important fishery. The back is a blackish blue, gradually fading into the silvery white of the belly. It is frequently found to weigh eighty pounds; its flesh is much whiter than that of the Tunny.

Auxis, Cuv.(2)

The corslet and moderate pectorals of the Tunny, and the dorsals, separate, as in the Mackerel. One species inhabits the Mediterranean.

Sc. bisus; Bonicou, or *Scombre Laroche*, of Risso; Rafin., Caratt. pl. ii, f. 1; Egypt., XXIV, 6. Back, of a fine blue; oblique blackish lines; flesh, a deep red.

Another is taken in the Antilles called the *Thou*, or *Tunny*, which attains a size equal to that of the European Tunny.(3)

Sarda, Cuv.(4)

Distinguished from the Tunnies solely by their separate, pointed, and strong teeth.

Sc. sarda, Bl. 334; Aldrov., 313; Salvian., 123; Belon, 179.(5) The only species known, but common in the Black Sea and Mediterranean. It is blue, the back obliquely streaked with blackish; remarkable for the extreme length of its gall-bladder; a fact well known to Aristotle.(1) It also inhabits both oceans.

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(1) Add. *Sc. coretta*, Cuv., Sloane, Jam., I, 1, 3;—*Dangiri mangelang*, Renard, I, lxxvi, 189.

(2) *Auxis*, ancient name of a fish of this family.

(3) Add, the *Tasard*, Lacep. IV, p. 8:—the *Albicore*, Sloane, Jam., I, 1, 1.

(4) *Sarda* was the ancient name of the Tunny that was caught and salted in the Western Ocean.

(5) It is the *Amia* of the ancients and of Rondelet, 238; the *Sarda* of Rond., 248, is the young of the same species. It is also the *Scomber palamitus* of Rafin.; the *Sc. ponticus*, Pall., Zoogr. Russ.

CYBIUM, Cuv.(2)

The body elongated, and without a corslet; large, compressed, trenchant teeth, resembling lancets; palatine teeth all small, short, and crowded. Several species are found in the hot parts of both oceans; some of them become very large.(3)

THYRSITES, Cuv.(4)

Differs from Cybium in the anterior teeth, which are longer than the others, and in having pointed, palatine teeth; no lateral carina to the tail.

This little subgenus leads insensibly to Lepidopus and to Trichiurus.(5)

GEMPYLUS, Cuv.(6)

Similar to Thyrsites in the jaw-teeth, but there are none in the palate, and the ventrals are almost imperceptible; an additional mark of affinity with Lepidopus.(7)

XIPHIAS, Lin.

These fishes belong to the family of the Scomberoïdes, and approach the Tunnies, particularly in their excessively small scales, in the carinæ on the sides of their tail, in the power of their caudal fin, and in their whole internal organization. Their distinguishing character consists in the beak, or long ensiform point or tusk, which terminates their upper jaw; a powerful weapon with which they attack the largest sea animals. This beak is chiefly composed of the vomer and intermaxillaries, being strengthened at its base by the æthmoid, frontals, and maxillaries. Their branchiæ are not pectinated; each of them being formed of two large parallel laminæ, the surface of which is reticulated.(1) They swim with astonishing swiftness, and their flesh is excellent.

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(1) Arist., Hist., II, c. xv. The gall-bladder of the common Tunny is equally as long.

(2) *Cybium*, the ancient name of a dish prepared from the Tunny and from another fish of the same family.

(3) *C. Commersonii*, Cuv., *Sc. Commersonii*, Lacep., or *Konam*, Russ., 135;—*C. lineolatum*, Cuv., *Mangelang*, Russ., I, vii, 53;—*C. guttatum*, Cuv., or *Sc. guttatus*, Bl., Schn. pl. v, *Vingeram*, Russ., 134;—*C. maculatum*, or *Sc. maculatus*, Mitch., Ann. New York Lyc., I, vi, 8;—*C. Regale*, Cuv., or *Sc. regalis*, Bl., 333, which is also the *Scomberomore Plumier*, Lacep., III, 293;—*C. cavalla*, or *Guarapucu*, Marcgr. 178.

(4) The ancient name of some fish of this family.

(5) *Scomber dentatus*, Bl., Schn., or *Sc. atun*, Euphrasen and Lacep., or *Acinacée bâtarde*, Bory St Vincent.

(6) The ancient name of an unknown fish.

(7) *Gempylus serpens*, Cuv., or *Serpens marinus compressus lividus*, Sloane, I, 1, f. 2.

XIPHIAS, Cuv.

The Sword-Fish, properly so called, has no ventrals. But one species is known.

Xiphias gladius, L. (The Sword-Fish.) The point horizontally flattened and trenchant like the broad blade of a sword; sides of the tail strongly carinated. It has but one dorsal, which rises from before and from behind; the middle of it becoming worn with age gives it the appearance of being double. It is one of the largest and best fishes of the European seas, frequently attaining the length of fifteen feet. It is more common in the Mediterranean than in the Atlantic Ocean. A parasitic crustaceous animal(2) penetrates into its flesh and sometimes renders it so furious that it dashes itself on shore.(3)

TETRAPTURUS, Rafin.

Point of the muzzle shaped like a stilet; each ventral consisting of a single non-articulated blade; two small salient crests on each side of the base of the caudal as in the Mackerel.

One species inhabits the Mediterranean, the *Aiguille* of the Sicilians, *Tetrapturus belone*, Rafin., Caratt., pl. i, f. 1.

MAKAIRA, Lacep.

The armed muzzle and two small crests of a Tetrapturus, but the ventrals are wanting.

But a single specimen has ever been seen, and that was captured at the island of Réen in 1802. It is the *Mak. noirâtre*, Lacep.; *Xiphias makaira*, Sh.(4)

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(1) This led Aristotle to say that the Xiphias has eight branchiæ.

(2) Improperly named by Gmelin, the *Pennatula filosa*.

(3) N.B. The *Xiph. imperator*, Bl., Schn., pl. 21, taken from Duham. Sect. IV, pl. xxvi, f. 2, is merely a copy of a bad figure given by Aldrovande (Pisc. p. 332) for that of the common Xiphias. This species must consequently be stricken off.

(4) It yet remains to be seen whether this was not a Tetrapturus that had lost its ventrals. The fig. of Lacép., IV, xiii, 3, is taken from the rude drawing of a fisherman.

Istiophorus, Lacep.—Notistium, Herman.

The beak and caudal crests of a Tetrapturus, but the dorsal is very high and serves them for a sail when swimming; their long and slender ventrals are composed of two rays.

There are several imperfectly determined species, one of which inhabits the Indian Ocean, *Scomber gladius*, Broussonet, Acad. des Sc. 1786, pl. x; *Xiphias velifer*, Bl., Schn.; *Xiphias platisterus*, Shaw, IV, part II, p. 101, and was long ago described.(1)

All the fishes of this genus attain a very large size.

Centronotus, Lacep.

A genus of Scomberoides characterized by the spines, which, in the Acanthopterygii in general, form the anterior portion of the dorsal, or a first separate dorsal, but in them are free and unconnected by a common membrane; they all have ventrals. They are subdivided as follows:

Naucrates, Rafin.

Free dorsal spines; body fusiform; a carina in the sides of the tail as in the Tunny, and two free spines before the anal fin.

The common species, or the *Faufre* of the sailors of Provence; *Gasterosteus ductor*, L.; *Scomber ductor*, Bl., 338, is blue with broad vertical bands of a much deeper blue. The vulgar name of *Pilot-fish* owes its origin to the fact, that it follows vessels to seize upon what may fall from them; and as a similar habit is observed in the Shark, it has been said that the former acts as a guide or pilot to the latter; it is not above a foot long.

A black species is found at Brazil, the *Ceixupira*, Marcgr., 158; *Scomber niger*, Bl. 337, which is eight or nine feet in length.

Elacates.

The general form of a Naucrates, and its free dorsal spines; but the head is horizontally flattened, and both the caudal carina and the free spines before the anal are wanting.(2)

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(1) It has also been figured by Nieuhof, App.; Willugb., App., pl. V, f. 9, by Renard, I, pl. 34, f. 182, and 11, pl. 54, f. 233; by Valentyn, No. 527. The *Guebucu*, Marcgr. 171, hardly appears to differ from the species of India. Bl. 345, is a falsified copy of a figure of Pr. Maurice, which differed much less from that of Marcgrave.

(2) *El motta*, Cuv., *Pedda mottah*, Russel, 153; *El. americana*, Cuv., *Centro-*

Lichia, Cuv.

The free spines on the back, and two others, also free, before the anal; body compressed, and the tail without the lateral carinæ. In front of the dorsal spines is a single one, laid flat, and pointing forwards.

Three species inhabit the Mediterranean, all of which are eatable, and already well characterized by Rondelet.

L. amia; Scomber amia, L.; the *Vadigo*, Rondelet, 254; *Amia*, Salv. 121. The lateral line strongly covered or forming an S; a large species more than four feet in length, and weighing a hundred pounds.

L. glauca; Sc. glaucus, L.; the *Derbio*, Rondel. 252. The lateral line nearly straight; the anal and second dorsal marked with a black spot in front; teeth small and crowded.

L. sinuosa, Cuv.; Rond. 255. The blue on the back separated from the silvery hue on the belly by a zigzag line; the hooked teeth in a single range.(1)

Lacépède separates from the Lichiæ, by the name of Scomberoides, which is not very appropriate, those species where the last rays of the second dorsal, and of the anal are divided into spurious fins, as in Scomber, properly so called.(2) The

Trachinotus, Lacep.

From which his Acanthrinions and Cœsiomores do not generically differ, are Lichiæ with an elevated body, a more vertical profile, and the dorsal and anal tapered into longer points.(3)

Rhynchobdella, Bl. Schn.

Free spines on the back as in Centronotus, and two free spines before the anal, but, as in a true Xiphias, the ventrals are wanting; the body is elongated. They are divided into two subgenera. In

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notus spinosus, Mitch., Ann. cit. Nov., I, iii, 9, which is probably the *Gasterosteus canadensis*, L.; and some new species.

(1) Add, *Scomb. calcar*, Bl. 336, f. 2.

(2) *Scomb. Forsteri*, Bl., Schn., or *Scomberoïde Commersonien*, Lacep., II, xx, 3, or *Aken parah*, Russ., 141;—*Tolparah*, Russ. 138;—*Sc. aculeatus*, Bl. 336, 1;—*Sc. lysan*, Forsk;—*Sc. saliens*, Bl. 335; and Lacep. II, xix;—*Gasterosteus occidentalis*, L., Brown., Jam., xlvi, 2;—*Quiebra-acha*, Parra, xii, 2.

(3) *Chætodon glaucus*, Lacep. 210, or *Acanthinion bleu*, Lacep. IV, 500;—*Chæt. rhomboides*, Bl. 209, or *Ac. rhomboide*, Lacep.;—*Gast. oratus*, L., or *Mookalée parah*, Russ. 154;—*Cæsiomore Bloch*, Lacep. III, iii, 2;—*Scomber falcatus*, Forsk.;—*Cæsiomore baillon*, Lacep. III, iii, 1;—*Botlah-parah*, Russel, 142.

MACROGNATHUS, Lacep.

The muzzle is prolonged into a cartilaginous point, which extends beyond the lower jaw; the second dorsal and the anal separated from the caudal.(1)

MASTACEMBELUS, Gronov.

The two jaws about equal, and the dorsal and anal almost united with the caudal.(2) Both subgenera inhabit the fresh waters of Asia and feed on worms, which they obtain from the sand. Their flesh is much esteemed.

This is perhaps the proper place for a genus not yet well understood. The

NOTACANTHUS, Bl.—CAMPILODON, Oth. and Fab.

The body much elongated, compressed, and covered with small soft scales; the obtuse muzzle projects in front of the mouth, which is armed with fine and closely-set teeth; nothing on the back but free spines; ventrals behind and beneath or on the abdomen; a very long anal reaches to the tip of the tail, where it unites with a very small caudal.

Not. nasus, Bl. 431. The only species known; it inhabits the Arctic Ocean, and is two feet and a half in length.

SERIOLA, Cuv.

All the characters of a Lichia; a horizontal spine before the first dorsal; a small free fin supported by two spines before the anal; body compressed; a lateral line without carina or armature; but the spines of the first dorsal are united into a fin by a membrane.

One species, the *Pêche lait* of the French at Pondichery; *Scomber lactarius*, Bl., Schn.; Russ., 108, is remarkable for the great delicacy of its flesh.

Another, *Seriola cosmopolita*, Cuv.; *Scomber chloris*, Bl., 339, is noticed as one of the few fishes common to both oceans.(3)

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(1) *Rynchobdella orientalis*, Bl. Schn., or *Ophidium aculeatum*, Bl., 159, 2, or *Macrognate aiguillonné*, Lacép. II, viii, 3;—*Rh. polyacantha*, Bl., Schn., or *Macrognate armé*, Lacép.; Buchan, pl. xxxvii, x, 6;—*Rh. aral*, Bl., Schn., pl. lxxxix;—*Macrog. pancalus*, Buchan., xxii, 7.

(2) *Rynchobdella halepensis*, Bl., Schn.; Gronov., Zooph., pl. viii, a, x.

(3) Add, *Seriole Dumeril*, Risso;—*Scomber fasciatus*, Bl., 341;—*Seriole de Rafinesque*, Risso, or *Trachurus aquilus*, Raff., Caratt. xi, 3.

There is a species whose last dorsal and anal ray is detached, *Seriola bipinnulata*, Cuv.; Zool. de Freycin., pl. 61, f. 3.

NOMEUS, Cuv.

These fishes, which for a long time were placed among the Gobies, are related in many particulars to the Seriolæ, but their extremely large and broad ventrals, attached to the belly by their internal edge, give them a very peculiar character.

Nom. mauritii, Cuv.; the *Harder*, Marcgr., 153. A species from the American seas; silvery, with transverse black bands on the back.(1)

TEMNODON, Cuv.

The tail unarmed; the small fin, or free spines before the anal, of the Seriolæ; the first dorsal is very slight and low, the second and the anal covered with small scales; but their principal character consists in a range of separate, pointed and trenchant teeth in each jaw; behind these, above, is a row of small ones, and the vomer, palatines and tongue are furnished with others, very small and crowded. The operculum terminates in two points, and there are seven rays in the branchiæ.

Tem. saltator, Cuv. The only well known species; it is about the size of a Mackerel, and one of the small number of fishes common to both oceans.(2)

CARANX, Cuv.

Scomberoides characterized by a lateral line more or less mailed with scaly plates or bands, carinated and frequently spinous. They have two distinct dorsals, a horizontal spine before the first; the last rays of the second but slightly connected, and sometimes separated into spurious fins; some spines, free, or forming a small fin before the anal.

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(1) It is the *Gobius Gronovii*, Gmel., the *Gobiomore Gronovien*, Lacep., the *Eleotris mauritii*, Bl., Schn., and the *Scomber zonatus*, Mitch. Ann. Op. cit. I, iv, 3,—it attains the size of a Salmon. The other, *Harder* of Marcgr., Braz., 166, appears to be a *Mugil*.

Harder or *Herder*, (Shepherd) is a name applied by Dutch sailors to various fishes for reasons similar to those which have induced European mariners to call the Naucrates, Pilot-fish, &c. It is even possible that from the resemblance of the black bands, our *Nomeus* may have been confounded with it.

(2) We possess specimens which scarcely differ from each other, from Alexandria, the United States, Brazil, Cape of Good Hope, and New Holland. It is the *Cheilodiptère leptacanthe*, Lacep., III, xxi, 3, copied from Commerson, and his *Pomatome skib*, IV, viii, 3, from Bosc. It is also the *Perca saltatrix*, L.; Catesb., II, viii, 2, or *Spare sauteur*, Lacép. Add, *Perca antarctica*, Carmich., Lin. Trans. XII, xxv

Several species inhabit the seas of Europe, resembling the Mackerel in form and flavour, and remarkable for the bands or plates which cover their lateral line, commencing from the shoulder.

They are confounded under the name of *Saurels*, *Bastard Mackerel*, &c.—*Scomber trachurus*, L., but they differ in the number of bands(1) and the more or less sudden curvature of the lateral line. Species very similar to those of Europe are found as far as New-Zealand.

In some, the plates merely cover the posterior and straight part of the lateral line, its anterior and arcuated portion being furnished with small scales. Some are fusiform, and of these, one has a single spurious, dorsal and anal fin,(2) another has several,(3) but most of them have none.(4)

Others again, which have a more elevated body, but still retain the oblique and but slightly convex profile, are remarkable for a single range of teeth.(5)

Some fishes of this genus, termed CARANGUES by the French sailors, have an elevated body and a sharp profile, convexly curved, and descending suddenly. The species are very numerous in both oceans.

C. carangus; Scomber carangus, Bl., 340. Silvery, with a black spot on the operculum, and frequently found to weigh from twenty to twenty-five pounds; an excellent fish. A very similar species, but in which the black spot is wanting; the *Guaratereba*, Seb. III, xxvii, 3, is, on the contrary, very apt to prove poisonous.(6)

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(1) There are from seventy to a hundred of these bands.

(2) *Kurra-woodagahwah*, Russ. 139;—*Car. punctatus*, Cuv., called *Scomber hippos*, by Mitch., New York, op. cit. I, v, 5, but which is not the hippos of Linnæus;—*Curvata pinima*, Marcgr. Braz. 150.

(3) *Scomber Rotleri*, Bl., 346, and Russel, 143;—*Sc. cordyla*, L., but not his synonymes, which are CARANGI.

(4) *Scomb. crumenophtalmus*, Bl., 343;—*Sc. Plumieri*, Bl., 344, the same as the *Sc. ruber*, 343, and as the *Caranx Daubenton*, Lacép. III, 71.

(5) *Scomb. dentex*, Bl., Schn.;—*Caranx lune*, Geoff. Saint-Hil., Eg. Poiss. xxiii, 3, to which the *Citula Banksii*, Riss., 2d ed. VI, 13, and perhaps the *Trachurus imperialis*, Rafin., Car. XI, 1, are, at least, closely allied.

(6) Add, the *Scomb. hippos*, L., which is the *Sc. chrysos*, Mitch.;—*Ekalah parah*, Russ. 146, perhaps the *Scomb. ignobilis*, Forsk.;—*Car. sex-fasciatus*, Quoy et Gaym., Zool., Freycin., pl. 65, f. 4;—*Jarra dandree parah*, Russ. 147;—*Scomb.*

We might also distinguish those species which have no teeth,(1) and those, the points of whose second dorsal and anal are extremely elongated, which I have designated by the name of CITULÆ.(2)

We are thus gradually led to fishes that may be united under the common name of

VOMER,

Which become more and more compressed and elevated, where the armature of the lateral line successively diminishes, and the skin becomes fine, satiny, and without any apparent scales, which have no other teeth than very short, fine and crowded ones, and which are distinguished from each other by various prolongations of some of their fins.

Linnæus and Bloch placed them, but improperly, in the genus ZEUS. We divide them as follows:

OLISTUS, CUV.

Differing from Citula, inasmuch as the middle rays of the second dorsal are not branched, but merely articulated, and are extended into long filaments.(3)

SCYRIS, CUV.,

The same filaments, and nearly a similar form; but the spines which should form the first dorsal are entirely hidden in the edge of the second. The ventrals are short.(4)

BLEPHARIS, CUV.

Long filaments to the second dorsal and anal; ventrals much prolonged, the spines of the first hardly piercing the skin;(5) body elevated; the profile not more curved than usual.

GALLUS, CUV.

The profile more vertical than in Blepharis, but all the other characters similar.(6)

Kleinii, Bl. 347, 2;—*Sc. Sansun*, Forsk;—*Kuguroo-parah*, Russ. 145;—*Tulan-parah*, Id. 150, or *Scomb. malabaricus*, Bl., Schn.;—*Wootin-parah*, Russ. 148.

(1) *Scomb. speciosus*, Lacep. III, 1, 1, or *Poloso-parah*, Russ. 149, of which the *Car. petaurista*, Geoff., Egypt., XXIII, 1, appears to be the adult.

(2) *Tchawil-parah*, Russ. 151;—*Mais-parah*, Id. 152.

(3) The species is new.

(4) The *Gal. d'Alexandrie*, Geoff., Eg., Poiss., XXII, 2.

(5) *Zeus ciliaris*, Bl. 196;—*Zeus sutor*, Cuv., the *Cordonnier* of Martinique.

(6) *Zeus gallus*, L., Bl., or *Gurrah-parah*, Russ. 57;—*Chewoola-parah*, Id. 58.

ARGYREIOSUS, Cuv.

The profile still more elevated; the first dorsal decidedly marked, and some of its rays prolonged into filaments like those of the second. Their ventrals also are much lengthened.(1) In

VOMER, *properly so called*,

The body is compressed, and the profile vertical, as in GALLUS and ARGYREIOSUS, but there is no prolongation to any of the fins.(2) The genus

ZEUS, Lin.

After abstracting the Galli and Argyreiosi, &c., comprehends fishes with a compressed body, an extremely protractile mouth like that of the Menides, and having but few and weak teeth. They require however to be greatly subdivided.

ZEUS, Cuv.

Dorsal emarginate, its spines accompanied by long slips of the membrane; a series of bifurcated spines along the base of the dorsal and the anal.

Z. faber, L., Bl. 41. (The Common Dory.) Yellowish, with a round black spot on the flank; an excellent fish, that is sometimes styled *the Fish of St Peter*.

Z. pungio, Cuv.; Rond. 328, is another species, distinguished by a stout bifurcated spine on the shoulder. From the Mediterranean.

CAPROS, Lacep.

The emarginated dorsal of the Dories, and a mouth still more protractile; but no spines along the dorsal and anal; the entire body covered with very rough scales.

But one species is known, *Zeus aper*, L., which is small and yellowish. It inhabits the Mediterranean.(3) The

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(1) *Zeus vomer*, Mus., Ad. Fred. xxxi, 9, and better, Bl. 93, 2, or *Abacatuia*, Marcgr. 161;—*Zeus rostratus*, Mitch., op. cit. II, 1. N.B. The *Zeus niger*, Bl., Schn., is founded on a mistake; a figure of the *Abacatuia*, in the work of Marcgrave, p. 145, having been placed next to the description of the *Guaperva*, or *Chætodon arcuatus*. The *Sélène argentée*, Lacep. IV, ix, 2, is an *Abacatuia*, whose first dorsal and ventrals had been worn. His *Sélène quadrangulaire*, is the *Chæt. faber*.

(2) *Zeus setapinnis*, Mitch., op. cit. I, 9, Labat., Voy. de Desmarchais, I, p. 312.

(3) It is also the *Perca pusilla* of Brunnich.

LAMPRIS, Retzius.—CHRYSOTOSUS, Lacep.

Has but a single dorsal, highly elevated before, as is the case with the anal; and which has but one small spine at the base of its anterior edge. There are ten very long rays to each ventral; the lobes of their caudal are also very long, but all these prolongations become worn away with age; sides of the tail carinated.

Lamp. guttatus, Retz. Violet spotted with white, and red fins.(1) It attains a large size, and inhabits the Arctic seas; the only species known.

EQUULA, Cuv.

A single dorsal, but with several small spines, the anterior of which are sometimes very long; the snout highly protractile; body compressed; edges of the back and belly dentated along the fins. They are small fishes, several species of which inhabit the Indian Ocean.(2)

The snout of some of these species, when in a state of quiescence, is singularly retracted; by suddenly protruding it they are enabled to seize upon such small fishes or insects as may pass within reach.(3)

MENE, Lacep.

Snout of an Equula, and the entire body more compressed; abdomen trenchant, and very convex beneath; a circumstance resulting from the development of the bones of the shoulder and pelvis, while the dorsal line is almost straight; which throws the ventrals behind the pectorals.

But one species is known; the *Mené Anne-Caroline*, Lacep.,

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(1) It is the *Zeus regius*, Bonnat. Encycl., Icthyol., f. 155; the *Z. imperialis*, Shaw, Nat. Misc., No. 140; the *Z. luna*, Gmel.; the *Z. guttatus*, Brunnich, Soc. des. Sc. de Copenh., III, 388; the *Scomber pelagicus*, Gunner, Mem. de Dronth., IV, xii, 1; the *Chrysotose lune*, Lacép. IV, ix, 3; the *Moon-Fish*, Duham., Sect. IV, pl. vi, f. 5; the *Opah* of Pennant, &c.

(2) The type of this genus is the *Scomber equula* of Forskal, of which Gmelin has made his *Centrogaster equula*, and Lacép. his *Cæsio poulain*. Add, *Eq. ensifera*, Cuv., or *Scomber edentulus*, Bl. 428, or *Leyognathe argenté*, Lacep.;—*Eq. cara*, Cuv., Russ. 66;—*Eq. fasciata*, Cuv., or *Clupea fasciata*, Lacep. V, p. 463, Mem. du Mus. I, xxiii, 2;—*Eq. splendens*, Cuv., Russ. 61;—*Eq. daura*, Cuv., Russ. 65;—*Eq. totta*, Russ. 62;—*Eq. coma*, Russ., et Seb. III, xxvii, 4, 63;—*Eq. ruconius*, Buchan, XII, 35;—*Eq. minuta*, Cuv., or *Scomber minutus*, Bl. 429, 2, which may very possibly be the same as the *Zeus argentarius*, Forster, IX, Schn. 96.

(3) *Eq. insidiatrix*, Cuv., or *Zeus insidiator*, Bl. 192, f. 2 and 3.

V, xiv, 2, or the *Zeus maculatus*, Bl., Schn. pl. xxii, Russell., 60. It is of a fine silver colour, spotted with blackish near the back. From the Indian Ocean.

STROMATEUS, Lin.

The same compressed form as in the different species of Zeus, and similar diminutive and slightly apparent scales, under a satiny epidermis; but the snout is obtuse and non-protractile; a single dorsal whose few spines are concealed in its anterior edge; no ventrals. The vertical fins are sufficiently thick to tempt us to approximate them also to the Squammipennes. Independently of the ordinary lateral line, there is a stria on the flank which has been considered as a second one. The œsophagus is armed with a number of spines which are attached to the *velvet* by radiating roots.

S. fiatola, L.; Belon, Aquat., 153; Rondel. 493.(1) A pretty, oblong species, inhabiting the Mediterranean, remarkable for spots and interrupted bands of a golden tint, on a lead coloured ground.

S. stellatus, Cuv., from the coast of Peru, is nearly similar in form, but is sprinkled with black spots; it is common in the markets at Lima.

Several other species inhabit the Indian Ocean, called by the French colonists *Pamples*. They are generally more elevated than the fiatola, and spines or trenchant blades are frequently found before their dorsal, and even their anal.(2) We may distinguish from among them the

PEPRILUS, Cuv.

Where the pelvis forms a trenchant and pointed blade, before the anus, that might be taken for a vestige of ventrals.(3) Besides this, there are the trenchant blades of which we have just spoken, and there is even one species in which these blades are crenated.(4)

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(1) This fig., in which the left pectoral is bent downwards, being mistaken by Lacép. for a ventral, gave rise to his genus *Chrysostromus*, which must consequently be suppressed.

(2) The *Stromateus niger*, Bl. 422, and better 160, under the false name of *Str. paru*, Russ. 43;—the *Str. albus*, Cuv., Russ. 44;—*Str. candidus*, Cuv., Russ. 42;—*Str. argenteus*, Euphrasen, New Stockh. Mem., IX, pl. ix, or *Str. aculeatus*, Bl., Schn.;—*Str. griseus*, Cuv.

(3) *Chætodon alepidotus*, L., or *Stromateus longipinnis*, Mitch.;—*Str. cryptosus*, Mitch.;—*Str. paru*, Sloane, Jam. II, pl. ccl, f. A.

(4) *Peprilus crenulatus*, Cuv., a small and new species.

LUVARUS, Rafin.

Apparently closely approaches Peprilus; the extremity of the pelvis is furnished with a small scale that acts as an operculum to the anus; no trenchant blades; a prominent carina on each side of the tail, as in the Tunny, &c.

Luv. imperialis, Rafin. Ind. d'Ittiol. Sicil., pl. i, f. 1. Silvery, with a reddish back; an extremely large species that inhabits the seas of Europe. (1)

SESERINUS, Cuv.

All the characters of the Stromatei, even internally; but there are two small ventrals, or rather vestiges of ventrals.

Ses. Rondeletii, Cuv.; Rondel. 157. A small species from the Mediterranean.

KURTUS, Bl.

The fishes of this genus are closely allied to those of Peprilus, from which they particularly differ in the less extent of their dorsal and in the development of their ventrals; the anal is long, the scales are so extremely small that they are hardly visible till the skin is dried; there are none on the fins; seven rays in the branchiæ; a pelvic spine between the ventrals, and several small trenchant blades before the dorsal, at whose base is a spine directed horizontally forwards.

A singularity of structure is presented in their skeleton; the ribs are dilated, convex, and form rings which are in contact with each other, thus enclosing a conical and empty space, which extends beneath the tail, in the inferior rings of the vertebræ, in a long and thin tube which contains the natatory bladder. The

Kurt. indicus, Bl., 169, is very probably the female of the *Kurtus cornutus* or *Somdrum-Kara-Mottee* of Russel, a fish very remarkable for a little cartilaginous and curved horn, which rises from the first of the small trenchant blades before the dorsal.

CORYPHÆNA, Lin.

The body compressed, elongated, covered with small scales; upper part of the head trenchant; a dorsal extending along the whole of

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(1) A specimen was taken at the isle of Ré, in 1826, a drawing of which was forwarded to us by M. Journal Rouquet.

I suspect that we should refer to it, at least as a congener, the *Ausonia Cuvieri*, Risso, 2d ed. pl. vi, f. 28, which is figured, however, with two anal spines the back, composed of rays almost equally flexible, although there is no articulation to the anterior ones; seven rays in the branchiæ.

Coryphæna, Cuv.

The head much elevated; its profile curved into an arc which descends very suddenly; eyes very far down; teeth in the palate as well as in the jaws. Large and beautiful fishes, celebrated for the rapidity of their motions, and the eternal war they wage against the Flying-fish.

> *C. hippurus*, L. Sixty dorsal rays; a silvery-blue above, with deep blue spots; a lemon-yellow with light blue spots beneath. From the Mediterranean. Several neighbouring species are found in the ocean, hitherto confounded with it.(1)

Caranxomous, Lacep.

The head oblong and but slightly elevated, the eye in a mediate position, thus differing in both these respects from the true Coryphænæ.(2) In the

Centrolophus, Lacep.

The palatine teeth are wanting; there is an interval without rays between the occiput and the commencement of the dorsal.(3) A species of each of these two last subgenera inhabits the Mediterranean, and occasionally strays into the ocean.

Astrodermus, Bonnelli.

The elevated and trenchant head and long dorsal of the Coryphænæ; but the mouth is slightly cleft; there are but four rays in the branchiæ, and their ventrals are very small and placed on the throat; the scattering scales of the body assume the radiated form of small stars.

> *Astrod. guttatus*, Bonn.; *Diana semilunata*, Risso, Ed. II, pl. vii, f. 14. Silvery, spotted with black; red fins, and a very high dorsal. From the Mediterranean, and the only species known.(4)

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(1) We will describe several of them in our Icthyology, and endeavour to settle their synonymes.

(2) *Scomber pelagicus*, L., Mus. Ad. Fred., xxx, f. 3, or *Cychla pelagica*, Bl., Schn.;—*Cor. fasciolata*, Pall., Spic., Zool., Fasc., VIII, pl. iii, f. 2.

(3) *Coryphyhæna pompilus*, L., Rondel. 250;—the *Centrolophe nègre*, Lacep. IV, 441, the same as the *Perca nigra*, Gmel., Borlasse, Hist. of Cornw., pl. xxvi, f. 8, or *Holocentre noir*, Lacep.; the *Merle*, Duham., Sect. IV, pl. vi, f. 2.

(4) *Astrodermus guttatus*, Bonnelli, or *Diana semilunata*, Riss. 2d ed., VII, f. 14.

PTERACLIS, GRONOV.—OLIGOPODUS, LACEP.

Teeth and head of the Coryphænæ; but the scales are larger, the ventrals jugular and very small, and the dorsal and anal as high as the fish itself.

P. velifer; Coryphæna velifera, Pall., Spic. Zool., Fasc., VIII, pl. 1.(1) From the Carolinas, and the only species known.

FAMILY VIII.

TÆNIOIDES.

This family is closely connected with the Scomberoides, and its first genus is even intimately allied with Gempilus and Thyrsites; the fishes which compose it are elongated, flattened on the sides, and have very small scales.

In the first tribe we find the muzzle elongated, the mouth cleft and armed with strong, pointed and trenchant teeth, and the lower jaw advancing beyond the upper one: it comprises but two genera,

LEPIDOPUS, Gouan.

Whose special character consists in the reduction of the ventrals to two small scaly plates; the thin and elongated body is furnished with a dorsal above, which extends throughout its length, with a low anal beneath, and terminates in a well formed caudal; there are eight rays in the branchiæ; the stomach is elongated, with upwards of twenty cæcums near the pylorus, and a prominent glandular body is attached to the natatory bladder, which is long and slender.

Lep. argyreus, Cuv. Frequently five feet in length; it has been described under several names,(2) and is found from England to the Cape of Good Hope, but is rare every where.

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(1) Bosc assures us that he caught it in Carolina; Pallas says that his is from the Moluccas.—They may be different species.

(2) It is the *Lepidopus* of Gouan., Hist. Pisc., pl. i, fig. 4; the *Trichiurus caudatus*, Euphrasen, New Stockh. Mem., IX, pl. ix, f. 2; the *Trich. gladius*, Holten, Soc. Hist. Nat. Copenh. V, p. 23, and pl. ii; the *Trich. ensiformis* of Vandelli, or *Vandellius lusitanicus* of Shaw; the *Ziphotheca tetradens* of Montagu, Werner. Soc. I, p. 81, pl. ii; the *Sarcina argyrea*, Rafin., Nuov. Caratt., pl. vii, f. 1; the *Lepidope Peron*, Risso; and the *Lepidope argenté* of Nardo.

TRICHIURUS, Lin.—LEPTURUS, Artedi.—GYMNOGASTER, Gronov.

The same form of body, muzzle, and jaws, as in Lepidopus; similar pointed and trenchant teeth, and a dorsal extending along the back, but the ventrals and caudal are wanting, and the tail is drawn out into a long, slender, and compressed filament. In lieu of the anal there is merely a suite of small and hardly perceptible spines on the under edge of the tail; the branchiæ have but seven rays. They resemble beautiful silver ribands; their stomach is elongated and thick; their intestines straight; their cæca numerous, and their natatory bladder long and simple.

Trich. lepturus, Lin.; Brown, Jam., pl. xlv, f. 4,(1) is found in the Atlantic, both on the coast of America and that of Africa.

Two other species are known from the Indian Ocean, one of which *Trich. haumela*, Schn.; *Clupea haumela*, Forsk., and Gmel.; *Savala*, Russel, I, 41, is very similar to the lepturus, being only somewhat shorter. The other, *Trich. savala*, Cuv., is still less elongated, and has a smaller eye.(2)

A second tribe comprehends genera in which the mouth is small, and but slightly cleft.

GYMNETRUS, Bl.

The body elongated and flat, as in all the preceding divisions, and totally deprived of the anal fin; but there is a long dorsal whose lengthened anterior rays form a sort of panache, but they are easily broken; the ventrals, when not worn or broken, are very long, and the caudal, composed of very few rays, rises vertically from the extremity of the tail, which ends in a small hook. There are six rays in the branchiæ: the mouth is slightly cleft, very protractile, and furnished with but few and small teeth; some small spines on the lateral line, which are more salient towards the tail. These fishes are extremely soft, and their rays very fragile; they have been frequently and incorrectly figured from mutilated specimens;(3) their bones, the vertebræ in particular, are but very slightly indurated, their stomach is elongated, and their cæca are very numerous; the natatory bladder is wanting, and their mucous flesh is very rapidly decomposed.

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(1) It is the *Ubirre* of Laet., Ind. Occid. 573, which, through a mistake, pointed out by himself, he has placed in Marcgr., p. 161, as belonging to the description of the *Mucu*, which is a Muræna; this mistake has produced such confusion, that Bloch and others were led to believe that the Trichiurus is a fresh-water fish.

(2) A transposition in the text of Nieuhof has caused electric properties to be attributed to the Trichiuri of India, which they most assuredly do not possess.

(3) The *Falx venetorum* of Belon, of which Gouan has made his genus TRA-

Several species are found in the European seas which differ in the number of their dorsal rays, and which when entire, that is when young, frequently present a most singular appearance from the prolongation of their fins.

The most brilliant of the Mediterranean species has but from one hundred and forty to a hundred and fifty dorsal rays: it has only been seen small, or of a moderate size. Another has from a hundred and seventy to a hundred and seventy-five, specimens of which are found in cabinets, from four to five feet in length. A third has more than two hundred of these rays, and is more than seven feet in length.

The Arctic ocean produces two species, called in Norway the King of the Herrings;(1) one of which is said by some to have one hundred and twenty rays, and by others one hundred and sixty, and to attain the length of ten feet; the other has more than four hundred rays, and is eighteen feet in length.(2) The ventrals consist of a long filament dilated near the extremity. They are also found in India.(3)

CHYPTERUS, and which has become the *Cepola trachyptera*, Gmel., only differs from the *Tænia altera* of Rondel., 327, and even from his *Tænia prima*, which is the *Cepola tænia*, L., and from the *Spada maxima*, Imperati, 517, or *Cepola gladius* of Walbaum, and from the *Tænia falcata*, Aldrov., or *Cepola iris* of Walbaum, in the various degrees of individual mutilation. It is the same with respect to the *Vogmar* of the Icelanders of Olafsen and Powelsen, Isl., tr. fr., pl. li, or *Gymnogaster arcticus* of Brunnich, Soc. Scient. Copenh., III, pl. xiii, which is the genus BOGMARUS, Bl., Schn.; with respect to the *Gymnètre cépèdien*, Risso. Ed. I, pl. v, f. 17; to the *Argyctius quadrimaculatus*, Rafin. Caratt., I, f. 3, to his *Scarcina quadrimaculata* and *imperialis;* to the *Gymnetrus mediterraneus* of Otto; to the *Epidesmus maculatus* of Ranzani, Opusc. Scientif. Fascic., VIII, and to the *Regalecus maculatus* of Narde, Phys. Journ., Pavia, VIII, pl. i, f. 1. All these fishes hardly differ in species and not in the least as to genus. Bonnelli's specimen was the least mutilated: he calls it *Trachypterus cristatus*, Acad. Turin, XXIV, pl. ix.

(1) It is the *Regalecus glesne*, Ascanius, Ic., Fasc. II, pl. xi, which he afterwards named *Ophidium glesne*, Mem. Soc. Scient. Copenh., III, p. 419, or the *Regalicus remipes*, Brunnich, Ib. pl. B, f. 4 and 5. Bloch., Syst., pl. 88, copies and alters the figure of Ascanius. A better copy is, Encycl. Method., f. 358.

(2) *Gymnetrus Grillii*, Lindroth, New Stockh. Mem., XIX, pl. viii.

(3) *Gymnetrus Russelii*, Shaw, IV, part. II, page 195, pl. 28.

Add the *Gymnetrus Hawkenii*, if the figure be correct; but the *Regalec lancéolé*, or *Ophidie chinoise*, Lacép., I, xxii, 3, or the *Gymnetrus cepedianus*, Shaw, does not belong to this genus.

STYLEPHORUS, Shaw.

A vertical caudal, as in Gymnetrus, but shorter; the extremity of the tail, instead of being curved into a small hook, is prolonged into a slender cord longer than the body.

S. chordatus, Shaw, Lin. Trans. I, vi, Nat. Misc., VII, pl. 274, and Gen. Zool., IV, part I, pl. ii. A badly preserved specimen, and the only one known. It was taken in the Gulf of Mexico, and for a long time we only had the above mutilated drawing of it. M. de Blainville however has given us a more regular figure; Journ. de Phys. tome LXXXVII, pl. i, f. 1, which exhibits no ventrals.

In a third tribe the snout is short, and the mouth cleft obliquely.

CEPOLA, Lin.(1)

A long dorsal and anal, both reaching to the base of the caudal, which is tolerably large; no rise in the cranium; snout short; lower jaw curved upwards; the teeth prominent, and the ventrals sufficiently developed. There are but two or three non-articulated rays in the dorsal, which are as flexible as the others; the spine of the ventrals is alone stiff and sharp; there are six rays in the branchiæ, and the abdominal cavity is very short as well as the stomach; there are some cæca and a natatory bladder which extends into the base of the tail.

Cep. rubescens, L.; Lin. Trans., VII, xvii; and Bl., 170, under the false name of *Cep. tænia*.(2) A Mediterranean species of a reddish colour.

LOPHOTES, Giorna.

A short head, surmounted with a high osseous crest; to whose summit a long and stout spine is articulated, bordered behind with a membrane and a low fin, whose rays are nearly all simple, extending from this spine to the point of the tail, which has a distinct, but very small caudal; an extremely short anal beneath that point; moderate pectorals, beneath which are scarcely perceptible ventrals, composed of four or five excessively small rays. The teeth are pointed and not crowded; the mouth is directed upwards, and the eye very large. There are six rays in the branchiæ, and the abdominal cavity occupies nearly the whole length of the body.

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(1) This name of CEPOLA, given by Willughby as a Roman synonyme of the *Fierasfer*, has been applied by Linn. to the present genus, to which the *Fierasfer* does not belong.

(2) Add the *Cepola japonica*, Krusenst. Voy. pl. lx, f. i.

L. cepedianus, Giorna, Mem. of the Imp. Acad. of Turin, 1805, 1808, p. 19, pl. 2. The only species known; it is found, though rarely, in the Mediterranean, and becomes very large.(1)

FAMILY IX.

THEUTYES.

Our ninth family is as closely allied to the Scomberoides as the preceding one, but in other points; such as the armature, which is found in several genera on the sides of the tail, or in others, the horizontal spine before the dorsal, &c. It contains but very few genera; they are all foreign, and have a compressed, oblong body, a small mouth, but slightly or not at all protractile, each jaw of which is armed with a single range of trenchant teeth; palate and tongue without teeth, and a single dorsal. They are herbivorous, feeding on fucus and other marine plants; their intestines are very large.

SIGANUS, Forsk.—BURO, Commer.—CENTROGASTER, Hout. —AMPHACANTHUS, Bloch.

These fishes have a remarkable character—unique, in icthyology—in their ventrals, which are furnished with two spinous rays, one external, the other internal, the three intermediate ones branching as usual. They have five branchial rays, and a horizontal spine before the dorsal. The styloid bones of their shoulder curve as they lengthen, so as to unite at their extremities with the first interspinal of the anal.(2)

Numerous species are found in the Indian Ocean.(3)

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(1) The description of Giorna is imperfect, because he only had a mutilated specimen of whose origin he was ignorant. I drew mine from an individual more than four feet in length, taken at Genoa. See An. Mus. XX, xvii.

(2) Geoffr., Phil. Anat. I, 471, and pl. ix, f. 108.

(3) *Theutis javus*, L., Gronov., Zoophyl., pl. VIII, f. 4;—*Siganus stellatus*, Forsk.;—*Amphac. punctatus*, Bl., Schn., or *Acanthurus meleagris*, Shaw;—*Buro brunneus*, Commers., Lacep., V. 421;—*Siganus rivulatus*, Forsk;—*Amphac. nebu-*

ACANTHURUS, Lacep. and Bl.—HARPURUS, Forst.

Teeth trenchant and notched; a strong movable spine on each side of the tail, that is as sharp as a lancet, and inflicts severe wounds on those who carelessly handle these fishes; hence their vulgar name of *Surgeons*. They inhabit the hot parts of both oceans.(1)

The dorsal of some species is very high.(2)

Some have a sort of brush composed of stiff hairs, before the lateral spine.(3)

In others again the teeth are deeply notched, or pectinated on one side.(4) The

PRIONURUS, Lacep.

Only differs from the preceding genus in the armature of the sides of the tail, which consists of a suite of fixed, horizontal and trenchant blades.(5)

NASEUS, Commers.—MONOCEROS, Bl. Schn.

Sides of the tail armed with fixed trenchant blades: but the teeth are conical, and the front projects in a kind of horn or knob above the muzzle; but four rays in the branchiæ and three soft ones in the ventrals; the skin resembles leather.(6)

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losus, Quoy and Gaym., Zool. Voy. Freycin., p. 369;—*Centrogaster fuscescens*, Houttuyn.;—*Chætodon guttatus*, Bl. 196;—*Amph. marmoratus*, Quoy and Gaym., Voy. Freycin., Zool., pl. 62, f. 1 and 2;—*Amph. magniahac*, Ib. f. 3;—*Centrogaster argentatus*, Houtt., and several others to be described in our Icthyology.

(1) *Chætodon chirurgus*, Bl., 208;—*Theutis hepatus*, L.; Seb. III, xxxiii, f. 3;—*Ac. glauco-pareius*, Cuv., Seb., III, xxv, 3, which appears to be the true *Chætodon nigricans*, L.;—*Chæt. triostegus*, Brousson., Dec. Icht. No. 4, or *Acanthure zèbre*, Lacép., which is also his *Chæt. zébre*, III, xxv, 3;—*Ac. guttatus*, Bl., Schn.;—*Ac. suillus*, Cuv., Renard, I, pl. xiv, f. 82;—*Chæt. lineatus*, L.; Seb. III, xxv, 1;—*Chæt. Achilles*, Broussonnet;—*Chæt. meta*, Russ. 82;—*Chæt. sohal*, Forsk., of which Lacép. has very improperly made a genus under the name of *Apisurus*;—*Ac. striatus*, Cuv.; *Paningu*, Renard, pl. 1, f. 8;—*Ac. argenté*, Quoy and Gaym. Voy. Freycin., p. 63, f. 3;—*Chæt. nigrofuscus*, Forsk.;—*Chæt. nigricans*, Bl. 203, which is not that of Linnæus.

(2) *Ac. velifer*, Bl. 427.

(3) *Ac. scopas*, Cuv., Renard, I, pl. xi, 101.

(4) *Ac. ctnedon*, Cuv., a new species.

(5) *Prionure microlepidote*, Lacép., An. Mus. IV, p. 205;—*Acanthurus scalprum*, Langsdorf.

(6) *Naseus fronticornis*, Cuv., Lacép. III, vii, 2, Bl., Schn., pl. 42, Hasseq., it. pal. 332;—*Nas. tandock*, Ren. I, iv, 23; Valent. 518;—*Chæt. unicornis*, Forsk., differ from our first species.—*Nas. brevirostris*, Cuv., Ren. I, xxiv, 130;—*Nas. tumifrons*,

Axinurus, Cuv.

More elongated and without horn or knob, but with the same branchial and ventral rays as in the preceding genus; each side of the tail armed with a single, square, trenchant blade, without a shield; the mouth very small and the teeth very slender.(1)

Priodon, Cuv.

The notched teeth of Acanthurus, the three soft ventral rays of Naseus, and the unarmed tail of Siganus.(2)

FAMILY X.

This family is distinguished by

LABYRINTHIFORM PHARYNGEALS.

By this we mean, that part of the superior pharyngeals of these fishes are divided into small irregular lamellæ, more or less numerous, intercepting cells containing water, which thus flows upon and humects the branchiæ, while the animal is removed from its proper element. By this it is enabled to quit the rivulet or pool, which constitutes its usual element, and crawl to a considerable distance from it, a singular faculty, not unknown to the ancients,(3) and which induces the people of India to believe that they fall from heaven.

Anabas, Cuv.

It is in this genus that we find the greatest degree of complication in these labyrinths; the third pharyngeals, however, have teeth *en pavés*, and there are others behind the cranium. Their body is

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Cuv., badly drawn, Ren. I, 178;—*Nas. incornis*, Cuv., Ren. I, f. 128, and not so well, f. 147, probably the *Acanthurus harpurus*, Shaw;—*Nas. carolinarum*, Quoy and Gaym. op. cit. pl. 63, f. 1;—*Nas. tuber*, Commers., or *Nason-Loupe*, Lacép., III, vii, 3, or *Acanthurus nasus*, Shaw, Renard, I, f. 79, Valent., No. 119 and 478.

(1) *Axinurus thynnoides*, Cuv., a new species brought by Quoy and Gaymard from New Guinea.

(2) *Priodon annularis*, Cuv., a new species brought from Timor by the same gentlemen.

(3) Theophrastus, in his treatise upon fishes which live out of water, speaks of small ones which leave their native streams for some time and then return to them, and says that they resemble a Mugil

round and covered with strong scales, their head broad, muzzle short and obtuse, and mouth small; the lateral line is interrupted at its posterior third. The borders of their operculum, suboperculum, and interoperculum strongly dentated, but not that of the preoperculum. There are five rays in the branchiæ, and many spinous ones in the dorsal, and even in the anal. The stomach is moderate, rounded, and their pylorus has but three appendages. But one species is known,

An. testudineus, Cuv.(1), called the *Paneiri* or *Tree-Climber*; highly celebrated because it not only leaves the water, but, according to Daldorf, even climbs up the shrubs on its banks; this latter assertion, however, is denied. Found throughout all India.

POLYACANTHUS, Kuhl.

Rays spinous; as numerous as in Anabas, and more so; the same mouth, scales, and interrupted lateral line; but neither of the opercula is dentated; the body is compressed, and there are four rays in the branchiæ; a narrow band of small, short, and crowded teeth in the jaws, but none in the palate; the branchial apparatus is more simple, and their pylorus has but two cæcal appendages.

Found in rivers, &c. throughout all India.(2) The

MACROPODUS, Lacep.

Only differs from Polyacanthus in a less extended dorsal, which terminates, as well as the caudal and the ventrals, in a slender point, more or less elongated. The anal is larger than the dorsal.

Fresh-water fishes, found in India and China.(3)

HELOSTOMA, Kuhl.

In addition to the characters of Polyacanthus, the fishes of this genus have a small compressed mouth, so protractile that it seems to advance from the sub-orbitals and to retreat between them; their very small teeth are attached to the borders of the lips, and not to the jaws or palate: there are five rays in the gills. The arches of the branchiæ, on the side next to the mouth, are furnished with lamellæ, nearly similar to the external ones, which may also assist in the process of respiration.(1) Their stomach is small, and has but two pyloric appendages, but their intestine is very long; the parietes of their natatory bladder are thick.

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(1) It is the *Amphiprion scansor*, Bl., Schn., p. 204 and 570, or *Perca scandens*, Daldorf, Lin. Trans. III, p. 62. It is also the *Anthias testudineus*, Bl., pl. 322, and the *Coius coboius*, Ham. Buchan, pl. xiii, f. 38.

(2) *Trichopodus colisa*, H. Buchan.;—*Trich. bejeus*, Id. 118;—*Trich. cotra*, Id. 119;—*Tr. lalius*, Id. 120;—*Tr. sola*, Id. Ib.;—*Tr. chuna*, Id. 121;—*Trichogaster fasciatus*, Bl., Schn., pl. xxxvi, p. 164;—*Chætodon chinensis*, Bl., pl. ccxviii, f. 1.

(3) The *Macropode vert doré*, Lacép. III, xvi, 1, and a new and much more beautiful species with alternate red and green bands.

OSPHROMENUS, Commers.(2)

All the characters of a Polyacanthus, but the forehead is somewhat concave; the anal larger than the dorsal, as in Macropodus; the suborbitals and lower part of the preoperculum very finely dentated; the first soft ray of the ventrals extremely long; six branchial rays and the body strongly compressed. A species of this genus originally from China,

> *Osphr. olfax*, Commers.; the *Gourami;* Lacep. III, iii, 2, becomes as large as the Turbot, and is considered even more delicious. It was introduced into the ponds of the Isle of France, where it increases rapidly, and has been taken thence to Cayenne. The female is said to form a cavity in the sand for the reception of her eggs. The

TRICHOPODUS, Lacep.

Differs from Osphromenus in having a more convex forehead, and a shorter dorsal, besides which there are but four rays in the branchiæ; the first soft ray of their ventrals very long.

> There is but one species known; a small fish of the Moluccas, marked with a black spot on the side.(3)

SPIROBRANCHUS, Cuv.

The general form of Anabas, but the opercula are not dentated; the operculum merely terminating in two points; a series of palatine teeth.

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(1) But one species is known (*Hel. Temminckii*, Cuv.), from the Moluccas, which we shall minutely describe in our Icthyology.

(2) This name is derived from ὄσφρομαι (*olfacio*), and was invented by Commerson, who conjectured that the hollow pharyngeals visible in this fish, as in others of the family, might be organs of smell, a kind of æthmoides.

N.B. The *Osphromene gal.* Lacép., *Scarus gallus*, Forsk. is a *Julis*, Nob.; but we have two new species of true Ophromeni, *Ophr. notatus*, and the *vittatus*, Cuv.

(3) It is the *Labrus trichopterus*, Gmel., Pall., Spic., Fasc. VIII, p. 45; the *Trichopterus Pallasii*, Shaw, IV, part II, p. 392; the *Trichogaster trichopterus*, Bl., Schn., and the *Trichopode trichoptère*, Lacep. N.B. The *Trichopode mentonnier*, Lacgr., or *T. satyrus*, Shaw, vol. IV, part II, p. 391, only rests upon a bad figure of Gourami.

Sp. capensis, Cuv. A diminutive fresh water fish from the Cape of Good Hope; the only species known. The

OPHICEPHALUS, Bl.

Resembles all the preceding genera in most of its characters, and particularly in the cellular conformation of the pharyngeals, which are adapted to retain water. These fishes also creep to a considerable distance from their liquid abodes, but what particularly distinguishes, and even separates, them, from all other Acanthopterygii, is the absence of spines in the fins, the first ray of their ventrals at most excepted, and even that, though simple, is not sharp and stiff. Their body is elongated and almost cylindrical; their muzzle short and obtuse; their head depressed and furnished above with scales, or rather polygonal plates, as in Anabas, &c. There are five rays in their branchiæ; the dorsal occupies nearly their whole length, the anal also is very long, the caudal rounded, the pectorals and ventrals moderate, and the lateral line uninterrupted. Their stomach is shaped like an obtuse sac; two tolerably long cæcums adhere to the pylorus. The abdominal cavity extends above the anal, close to the end of the tail. The jugglers of India exhibit this fish out of water, and even the children amuse themselves by forcing it to crawl upon the ground. In the markets of China the larger species are cut up alive for distribution.(1) They may be divided by the number of their dorsal rays.

Some have but thirty odd of these rays.(2)

Others forty odd.(3)

Some again have more than fifty.(4)

FAMILY XI.

MUGILOIDES.

Our eleventh family of the Acanthopterygii is composed of the genus

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(1) This is most incontestably the genus alluded to by Theophrastus.

(2) *Ophicephalus punctatus*, Bl., or *Oph. lata*, Buchan;—*O. marginatus*, Cuv., or *O. gachua*, Buchan.? pl. xxi, f. 21, or *Cor. motta*, Russel, II, pl. 164;—*O. aurantiacus*, Buch.

(3) *Ophicephalus striatus*, Bl. 359, or *Muttah*, Russel, pl. 162, or *O. chena*, Buch.? —*O. sola*, Id.;—*O. sowara*, Russ. 163.

(4) *Ophicephalus marulius*, Buch., which is the *Bostrichoïde œillé*, Lacep. II, xiv, 3;—*Oph. barca*, Buch. xxxv, 20, to which the *Bostriche tacheté*, Lacep. III, p.

MUGIL, Lin.

These fishes present so many peculiarities in their organization, that they may be considered as forming a distinct family; their body is almost cylindrical, covered with large scales, and furnished with two separate dorsals, the first of which has but four spinous rays; the ventrals are inserted a little behind the pectorals. There are six rays in the branchiæ; their head is somewhat depressed, and covered with large scales or polygonal plates, their muzzle very short. Their transverse mouth, in consequence of a prominence in the middle of the lower jaw, which corresponds with a depression in the upper one, forms an angle, the teeth being excessively tenuous, and frequently almost imperceptible. Their pharyngeal bones, highly developed, give an angular form to the opening of the œsophagus, similar to that of the mouth, which only permits fluids or very small matters to pass into the stomach, notwithstanding which, this stomach terminates in a sort of fleshy gizzard, analogous to that of Birds: they have but few pyloric appendages, but the intestine is long and doubled.

They resort to the mouths of rivers in large troops, and are continually leaping out of the water; the European seas produce several species hitherto very imperfectly ascertained; their flesh is esteemed.(1)

M. cephalus, Cuv. (The Common Mullet.) Distinguished from all the other species of Europe by its eyes, which are half covered by two adipose veils, adhering to the anterior and posterior edge of the orbit; by the fact, that when the mouth is closed, the maxillary is completely hidden under the sub-orbital; and by the base of the pectoral being surmounted by a long and carinated crest. The nasal openings are separated from each other, and the teeth are tolerably prominent. It is the largest and best of the Mediterranean species. We have not seen it on the Atlantic coast of Europe, but its characters are visible in several species of India and of America.(2) Another species

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143, is at least very closely allied, and several new species to be described in our Icthyology.

(1) Linnæus and several of his successors have confounded all the European Mullets under a single species, their *Mugil cephalus*.

(2) America produces five or six species badly characterized and confounded by Linn., under the name of *M. albula*. Among the number is the *M. Plumieri*, Bl., become a *Sphyræna* in Bl., Schn., p. 110, and the *M. lineatus*, Mitch. The true *cephalus* of the Mediterranean is found on the whole African coast. Add, of species from India, the *Bontah*, Russel, II, 180, or the *M. our*. of Forsk., perhaps the same as our cephalus;—the *Kunnesee*, Id. 181 —*M. corsula*, Buch., pl. ix, 97.

nearly as large and common to the Mediterranean and the ocean is the

M. capito, Cuv.; the *Romando* of Nice. The maxillary visible behind the commissure of the jaws even when the mouth is closed; much weaker teeth; nasal orifices approximated; the skin of the edge of the orbit not extending to the globe of the eye; the sur-pectoral scale short and obtuse; a black spot at the base of the latter fin.(1)

Two smaller species, *M. auratus*, and *M. saltator*, Risso, approach the capito; the maxillary of the first is hidden under the sub-orbital as in the cephalus, but the nasal orifices are approximated as in the capito; the other, with the characters of the capito, has an emarginated sub-orbital which allows the end of the jaw to be seen.(2) A third large species also common to both seas, is the

M. chelo, Cuv. Particularly distinguished by its extremely bulky fleshy lips, whose edges are ciliated, and by teeth which dip into their substance like so many hairs; the maxillary is recurved, and shows itself behind the commissure.

M. labeo, Cuv., a small, Mediterranean species, has, in proportion to its size, still larger lips, with crenated borders. Several of these thick lipped species are found in the Indian Ocean.(3) The

TETRAGONURUS, Risso,

So called from the two salient crests that are found on each side near the base of the caudal, is another of these insulated genera, which seem to indicate particular families. These fishes are partly allied to the Mullets, and partly to the Scomberoides. Their body is elongated; their spinous dorsal long but very low, the soft one approximated to it, short but higher, and the anal corresponding to the latter; the ventrals are a little distance behind the pectorals. The branches of the lower jaw, which are raised vertically and provided with a range of transparent pointed teeth, forming a kind of saw, are enclosed, when the mouth is shut, by those of the upper one. There is also a small series of pointed teeth in each palatine, and two in the vomer. Their stomach is fleshy and doubled, their cæcums numerous, and their intestine long. The œsophagus is furnished internally with hard and pointed papillæ.

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(1). This appears to us to be the species particularly described by Willoughby and figured by Pennant.

(2) Add the *M. christian*, Voy. Freycin.;—*M. Ferrandi*, Ib.;—*M. parsia*, Buch., pl. xvii, f. 71;—*M. curcasia*, Id.;—*M. peradak*, Cuv., Russ. 182.

(3) *M. crenilabis*, Forsk.;—*M. cirrhosthomus*, Forst., App. Bl., Schn., 121.

N.B. The *M. cæruleo-maculatus*, Lacép. V, 389, the same represented under the name of *crenilabis*, pl. xiii, f. 1, belongs to the same group as the capito. The *Mugil appendiculatus*, Bosc., or *Mugilomore Anne-Caroline*, Lacep., V, 398, is nothing else than the *elops*, which is also the fact as respects the *Mugil salmoneus*, Forst., Bl., Schn. 121;—*Mugil cinereus*, Walbaum, Catesb. II, xi, 2, is a Gerrcs;—the *M. chanos*, Forsk., belongs to the Cyprinidæ.

Tetrag. Cuvieri, Risso; *Courpata* or *Corbeau*, of the Mediterranean coast, is the only species known, and is never taken except in very deep water. It is a foot long, and black; the scales hard, deeply striate and indented. The flesh is said to be poisonous.(1)

I also place a genus between the Mugiloides and the Gobioides, which does not completely harmonize with any other. I mean the

ATHERINA, Lin.

The body elongated; two dorsals widely separated; the ventrals further back than the pectorals; the mouth highly protractile and furnished with very minute teeth; a broad silvery band along each flank on all the known species. There are six rays in the branchiæ; the stomach has no cul-de-sac, and their duodenum no cæcal appendages. The transverse processes of the last abdominal vertebræ are bent, and thus form a little conical bag or cornet, which receives the point of the natatory bladder. These little fishes are highly esteemed for the delicacy of their flesh. The young ones remain for a long time in crowded troops, and are consumed on the coast of the Mediterranean under the name of *Nonnat*, the *Aphyes* of the ancients. Several species inhabit European seas, hitherto confounded with the *Ath. hepsetus*, L.

Ath. hepsetus, Cuv.;(2) *Sauclet* of Languedoc, or *Cabassous* of Provence; Rondel., 216; Duham., sect. VI, pl. iv, f. 3. The head somewhat pointed; nine spinous rays in the first dorsal; eleven soft ones in the second, and twelve in the anal; fifty-five vertebræ in all.

Ath. Boyer, Risso; *Joel* or *Cabassouda*, Rondel., 217. The head broader and shorter, the eye larger; seven spines in the first dorsal, eleven rays in the second, thirteen in the anal; forty-four vertebræ in all.

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(1) There is no good figure of it: *Mugil niger*, Rondel. 423; *Corvus niloticus*, Aldrov., Pisc., 610; Risso, Ed. I, pl. x, f. 37.

(2) This is probably the special type of the hepsetus of Linnæus. It is necessary to observe that the figure called *Atherina hepsetus*, Bl., pl. cccxciii, f. 3, and Syst., pl. xxix, f. 2, is purely ideal.

Ath. mochon, Cuv. The form of the Sauclet; but there are seven spines in the first dorsal, fifteen soft rays in the anal, and forty-six vertebræ.

Ath. presbyter, Cuv.; the *Prêtre*, *Abusseau*, &c.;(1) Duham. Sect. VI, pl. iv, f. 1, 2, 3, 4, 6, 7. The muzzle a little shorter than that of the Sauclet; eight spines in the first dorsal, twelve soft rays in the second, fifteen or sixteen in the anal, and fifty vertebræ.

The Atherinæ foreign to Europe are numerous.(2)

FAMILY XII.

GOBIOIDES.

The Gobioides are known by the length and tenuity of the dorsal spines. All these fishes have about the same kind of intestines, that is, a large uniform intestinal canal without cæca, and no natatory bladder.

Blennius, Lin.

A strongly marked character in the ventral fins, which are placed before the pectorals and consist of only two rays. The stomach is slender and has no cul-de-sac, the intestine large but without a cæcum, and there is no natatory bladder. The body is elongated and compressed, and has but a single dorsal almost entirely composed of simple but flexible rays. They live in small troops among the rocks on the coast, leaping and playing, and are capable of living without water for some time. A slimy mucus is smeared over their skin, to which they owe their Greek name of *Blennius*. Several are viviparous, and there is a tubercle near the anus of all of them and in both sexes, which appears destined for the purposes of coition. We divide them as follows:

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(1) So called from the silvery band on the flanks, which has been compared to a stole.

(2) *Ather. lacunosa*, Forst., Bl., Schn., 112, probably the *hepsetus*, Forsk., 69;—*A. endra[illegible]tensis*, Quoy and Gaym., Freycin., Zool., p. 334;—*A. Jacksoniana*, Id. 333;—*A. brasiliensis*, Id. 332;—*A. neso-galica*, Cuv., Lacép. V, pl. xi, f. 1, which is not the same as the *A. pinguis* of the text.—*A. mænidia* of Lin., which is not as he supposes the *mænidia* of Brown, Jam. pl. xlv, f. 3, but is the *A. notata*, Mitch. op. cit. I, pl. iv, f. 6; and several others to be described in our Icthyology.

Blennius, Cuv.

Long, equal, and closely set teeth, forming but a single and regular range in each jaw, terminated behind, in some species, by a longer and hooked tooth. The head is obtuse, the muzzle short, and the forehead vertical; the intestines broad and short. Most of them have a fimbriated appendage on each brow, and several have another on each temple. Several species of this subdivision are taken along the coast of France; one of the most remarkable is the

Bl. ocellaris, Bl. 167, 1. The dorsal bilobate, its anterior lobe elevated and marked with a round and black spot, surrounded with a white circle and a black one.

Bl. tentacularis, Brünn.; Bl. 167, 2, under the name *Bl. gattorugine*. The dorsal even, four filaments on the brows; a black spot between the fourth and fifth rays.

Bl. gattorugine, L.; Will. II, 2, and Bl. 162, 1, 2, under the name of *Bl. fasciatus*. But two filaments; dorsal almost even; marked with clouded and oblique brown bands.

Bl. palmicornis, Cuv.; Penn. Cop. Encycl. Method., f. 111, under the name of *gattorugine*. The dorsal even; the appendage over the eye fimbriated.(1)

The sur-ocular fimbriated appendages are hardly visible in others, but they have a membranous prominence on the vertex which dilates and becomes red in the nuptial season. Some of them are found in European seas. Such are,

Bl. galerita, L., Rondel, 204; *Bl. pavo*, Riss. The dorsal even; spotted and streaked with blue; a black ocellated spot behind the eye.

Bl. rubriceps, Riss. Three first rays of the dorsal elevated, forming a red point; top of the head of the same colour.

Others again—the Pholis,(2) Arted., have neither panache nor crest. One of them, a very small fish, is common on the coast of France.

Bl. pholis, L. Bl.; 71, 2. Profile vertical; the dorsal slightly emarginate, dotted and marbled with brown and blackish.

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(1) Add, *Bl. cornutus*, L.;—*Bl. pilicornis*, Cuv., *pumaru*, Marcgr. 165, the second figure, but the first description, &c.

(2) *Pholis*, the Greek name of a fish always enveloped in mucus. Add, *Bl. cavernosus*, Schn., 37, 2;—*Gadus salarias*, Forsk, p. 22.

We distinguish from these Blennies, properly so termed, by the name of

Myxodes, Cuv.

Species with an elongated head, a pointed muzzle projecting in front of the mouth, and a single range of teeth, as in the Blennies, but without canines;(1) and by that of

Salarias, Cuv.

Species whose teeth, also forming a single range and placed close to each other, are compressed laterally, hooked at the end, inexpressibly slender, and immensely numerous. They move, in the recent specimen, like the keys of a harpsichord. Their head, strongly compressed, above, is very broad below; their lips are thick and fleshy, their profile is completely vertical, and their spirally convoluted intestines are longer and thinner than in the Common Blenny. The only species known are from the Indian Ocean.(2) We call

Clinus, Cuv.(3)

Those with short pointed teeth, scattered in several ranges, the first of which is the largest. Their muzzle is less obtuse than in the two preceding subgenera, their stomach wider and their intestines shorter.

In some, the first rays of the dorsal form a point separated by an emargination from the rest of the fin;(4) small fimbriated appendages on the eye-brows.

There are even some of them in which the first rays are altogether forward, and seem to form a pointed and radiated crest on the vertex.(5)

In others again, the dorsal is continuous and even.(6)

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(1) The species are new.

(2) *Sal. quadripinnis*, Cuv., which is the *Blennius gattorugine*, Forsk., p. 23;—*Bl. simus*, Sujef. Act. Petrop. 1779, part II, pl. vi;—the *Alticus*, or *Saltator* of Commers., Lacép., II, p. 479, and several new species. I have every reason to believe that to this subgenus we should also refer the *Bl. edentulus*, Bl., Schn., or the *truncatus* of Forster, notwithstanding it is said to be without teeth.

(3) *Clinus*, the modern Greek term for the Blenny.

(4) *Bl. mustelaris*, L., Mus. Ad. Fred. xxxi, 3;—*Bl. superciliosus*, Bl. 168;—*Bl. argenteus*, Risso. N.B. The *Blennie pointillé*, Lacép. II, xii, 3, appears to me to be a badly preserved specimen of the *superciliosus*.

(5) *Bl. fenestratus*, Forst., Bl., Schn., p. 173.

(6) *Bl. spadiceus*, Schn., Seb. III, xxx, f. 8;—*Bl. acuminatus*, Id., Seb., Ib. 1;—*Bl. punctatus*, Ott., Fabr., Soc. Hist. Nat. Copenh. vol. II, fasc. II, pl. x, f. 3;—

CIRRHIBARBA, Cuv.

The form of a Clinus; teeth small and crowded, and besides a little tentaculum over the eye and one in the nostril, there are three large ones at the end of the muzzle, and eight under the point of the lower jaw.

But one species is known, from India, of a uniform fawn colour.

MURÆNOIDES, Lacep.—CENTRONOTUS, Schn.

The ventrals smaller than in any of the other Blennies, and frequently reduced to a single ray. Their head is very small, and their body elongated like the blade of a sword; a dorsal, all of whose rays are simple and without articulations, extends along the whole length of the back. The teeth are like those of a Clinus, and their stomach and intestines of one uniform appearance.

Bl. gunnellus, L.; Bl., 71, 1; Lacep., II, xii, 2. Very abundant on the coast of France; there is a suite of ocellated spots along the whole base of the dorsal.

OPISTOGNATHUS, Cuv.

The form of a true Blenny, and particularly its short snout; distinguished by very large maxillaries prolonged behind into a kind of long, flat moustache; rasp-like teeth in each jaw, the external row strongest; three rays in the ventrals, which are placed exactly under the pectorals.

O. Sonnerati, Cuv., is the only species known; it was brought from the Indian Ocean by Sonnerat.

ZOARCUS, Cuv.

We dare not separate these fishes from the Blennies, although they have no spinal ray; for they are provided with their anal tubercle, intestines without cæca, and smooth, oblong body, six rays in the branchiæ. There are three rays in the ventral; teeth conical, forming a single row on the sides of the jaws, and several in front; none in the palate; the dorsal, anal, and caudal are united, not however until the dorsal is considerably depressed.

Z. viviparus; Bl. viviparus, L.; Bl., 72. A foot long; fawn coloured, with blackish spots along the dorsal; from the seas

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Bl. Audifredi, Risso, pl. vi, f. 15;—*Bl. capensis*, Forster, Bl. Schn., 175;—*Bl. lumpenus*, Walb., Arted. Renov. part III, pl. iii.

of Europe and throughout the North; it has long been recognized as viviparous.

Z. labrosus, Cuv.; *Bl. labrosus*, Mitch. op. cit. I, 1, 7. A much larger American species which is three feet and more in length; it is of an olive colour, sprinkled with brown spots.

ANARRHICHAS, Lin.(1)

So very similar are these fishes to the Blenny, that I would willingly name them *Blennies without ventrals.* The dorsal fin entirely composed of simple, but not stiff rays, commences at the nape of the neck, and extends, as well as the anal, close to that of the tail, which is rounded, as well as the pectorals. Their whole body is smooth and slimy. Their palatine bones, vomer and mandibles, are armed with stout, bony tubercles, surmounted with small enamelled teeth, the anterior ones however are longer and more conical. This mode of dentition furnishes them with powerful weapons, which, added to their great size, render them ferocious and dangerous.

A. lupus, L. Bl., 74 (The Sea-Wolf), is the most common species; it inhabits northern seas, and is frequently seen on the coast of Europe; six or seven feet long; brown, with clouded bands of deep brown; the flesh resembling that of an eel. This fish is valuable to the Icelanders, who salt and dry the flesh for food, employ the skin as shagreen, and the gall as soap.(2) The

GOBIUS, Lin.

Commonly called *Gobies* or *Sea-Gudgeons*, are instantly recognized by the union of their thoracic ventrals, either along the whole of their length, or at least at their base, forming a single hollow disk more or less infundibuliform. The spines of the dorsal are flexible, the branchial apertures provided with five rays only, and generally but slightly open. Like the Blennies, they can live for some time out of water, their stomach has no cul-de-sac, and the intestinal canal is not furnished with cæca; finally, the males have the same little appendage behind the anus, and some species are known to be viviparous. They are small or moderate sized fishes, which live among the rocks near the shore. Most of them have a simple natatory bladder.

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(1) *Anarrhichas*, Climber, a name invented by Gesner (Paralipomen, p. 1261,) because this fish is said to climb upon rocks and shoals by the aid of its fins and tail.

(2) The petrified teeth of this fish have been considered as constituting *Bufonites*, but they have neither their form nor tissue.

Add the *Anarr. minor*, Olafsen., Voy. en Isl. Fr. Trans., pl. L.

Gobius, Lacep. and Schn.

In the true Gobies the ventrals are united throughout their whole length and even before their base by a traverse, so as to form a concave disk. The body is elongated; head moderate and rounded; cheeks inflated and the eyes approximated; two dorsal fins, the last of which is long. Several species inhabit the seas of Europe, whose characters are not yet sufficiently ascertained.(1)

They prefer a clayey bottom, where they excavate canals in which they pass the winter. In the spring they prepare a nest in some spot abounding with fucus, which they afterwards cover with roots of the Zostera; here the male remains shut up, and awaits the females, who successively arrive to deposit their eggs; he fecundates them, and exhibits much care and courage in defending and preserving them.(2)

G. niger, L.; Penn., Brit. Zool. pl. 38. (The Common Goby.) Body blackish-brown; dorsals bordered with whitish; the most common species on the coast of Europe. The extremities of the superior rays of the pectorals are free; length, four or five inches.

G. jozzo, Bl., 107, f. 3. (The Blue Goby.) Brown, marbled with blackish; blackish fins; two white lines on the first dorsal, whose rays are prolonged in filaments above the membrane.

G. minutus, L.; *Aphia*, Penn. pl. 37. (The White Goby.) Body a pale fawn-colour; fins whitish, transversely marked with fawn-coloured lines: length, from two to three inches.

The Mediterranean, which is perhaps inhabited by these three species, produces several others of different sizes and colours.(3)

G. capito, Cuv.; Gesner, 396. (The Great Goby.) Olive, marbled with blackish; lines of blackish points on the fins; the head broad and the cheeks inflated; length one foot and more.

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(1) Bélon and Rondelet have endeavoured to prove that this fish is the *Gobius* of the ancients, and Artedi pretends to have found in the ocean the badly determined Mediterranean species of those authors. Hence has arisen a most inextricable confusion, to disentangle which, it is necessary to recommence both descriptions and figures, a task we shall partially undertake in our Icthyology.

(2) These observations were made by the late Olivi, on a Goby of the canals of Venice, which he considers identical with the *niger*, but which is perhaps another of the numerous Mediterranean species; they are given by M. de Martens in the second volume of his Voy. to Venice, p. 419. My conclusion is, that the Goby is the *Phycis* of the ancients, "*the only fish that constructs a nest*," Arist. Hist., lib. VIII, cap. xxx.

(3) See the descriptions, but without wholly adopting the nomenclature of Risso, Icht. de Nice, p. 155, et seq.

G. cruentatus, Gmel. (The Bloody Goby.) Large; brown, marbled with grey and red; lips and operculum marbled with a blood-red; red lines on the first dorsal; lines of salient points forming an H on the nape of the neck, &c.

Some species are also found in fresh water; such is the *Gob. fluviatilis* observed by Bonnelli in a lake in Piedmont, smaller than the *niger*, blackish, without the free pectoral filaments, and a black spot above the branchial aperture. A large one is obtained in the environs of Bologna, the *G. lota*, Cuv.; brown; blackish veins on the cheek; a little blackish spot on the base of the pectoral, and another on each side of that of the caudal.

Among the Gobies foreign to Europe, we may observe the *G. macrocephalus; Cottus macroceph*,. Pall., Nov. Act. Petrop., I, pl. x, f. 4, 5, 6, on account of the extreme length of its head, and the *G. lanceolatus*, Bl., 33, 1; *G. bato*, Buch., pl. 37, f. 10; *Eleotris lanceolata*, Bl., Schn., pl. xv, which we call the *Gobius elongatus*, on account of their elongated form and pointed caudal.(1) The

GOBIOIDES, Lacep.

Only differ from the Gobies in the union of their dorsals, which form but one. Their body is more elongated.(2) The

TÆNIOIDES, Lacep.

With the single dorsal of the Gobioides, have a still more elongated body. Their physiognomy is extremely singular; the upper jaw is very short, the lower, elevated and every where convex, ascends in front of it, both being armed with long hooked teeth; the eye is almost reduced to nothing, and is completely hidden under the skin. The cavity of the mouth is occupied by a fleshy and nearly globular tongue; some small cirri beneath the lower jaw.

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(1) Among these species foreign to Europe we may unhesitatingly place the *Gobius Plumierii*, Bl. 175, 3;—*G. lagocephalus*, Pall. VIII, pl. 11, f. 6, 7;—*G. Boddarti*, Id. Ib. pl. 1, f. 5;—*G. ocellaris*, Brouss., Dec., pl. 11;—*G. bosc.*, Lacép. II, xvi, 1, or *G. viridi-pallidus*, Mitch. op. cit. I, 8, or *G. alepidotus*, Bl., Schn.;—*G. Russelii*, Cuv., Russ. I, 53;—*G. giuris*, Buchan., pl. xxxiii, f. 13; Russ. 1, 50;—*G. changua*, Buch. pl. V, f. 10;—the *Bostryche chinois*, Lacép. II, xiv, and many new species to be described in our Hist. des Poissons.

(2) *Gob. Broussonnet*, Lacép. II, pl. xvii, f. 1, (*Gob. oblongatus*, Schn., add, 548).

But one species is known, the *Tænioide Hermannien*, Lacep., which lives in the mud of ponds, in the East Indies.(1)

Bloch, Schn., p. 63, very properly separates from the whole genus *Gobius;* the

PERIOPHTALMUS, Schn.

Where the entire head is scaly; the eyes are placed side by side, and provided at their inferior edge with an eye-lid which can be made to cover them, and the pectorals are covered with scales for more than half their length, which give them the appearance of being attached to a sort of arms. Their gills being even narrower than those of other Gobies, they can live out of water for a still longer period. They are often seen in the Moluccas, where they inhabit, creeping and leaping over the mud, either to escape from their enemies, or to seize upon the small Shrimps, which constitute their chief food.

Some of them have the concave, disc-like ventrals of the true Gobies.(2)

The ventrals of others are divided nearly to the base.(3)

I would also separate the

ELEOTRIS, Gronov.

Fishes, which, like the Gobies, have flexible spines in the first dorsal and the post-anal appendage, but whose ventrals are entirely distinct, the head obtuse and slightly depressed, the eyes at a distance from each other, and which have six rays in the branchial membrane. Their lateral line is but slightly marked, and their viscera are similar to those of the Gobies. Most of them inhabit fresh water, and frequently live in the mud.

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(1) It is the *Cepola cæcula*, Bl., Schn., pl. liv, from a drawing by John: the *Tænioïde hermannien*, Lacep. II, xix, 1, from a Chinese drawing; and the *Gobioïde rubicunda*, Buch., pl. v, f. 9.

(2) *Gobius Schlosseri*, Pall., Spic. VIII, pl. 1, f. 1—4, to which must be added the *Gob. striatus*, Schn., xvi, left among the *Gobies*, though it is hard to say why, since it is a true *Periophtalmus*.

(3) *Gobius Kolreuteri*, Pall., Spic. VIII, pl. 11, f. 13;—*Per. ruber*, Schn.;—*Per. papilio*, Schn., pl. xxv.

N.B. Both the *Gobies* and the *Periophtalmi* with divided ventrals, according to the system of M. de Lacépède, would be *Gobiomores;* if, together with this division of the ventrals, they had but one dorsal, they would be *Gobiomoïoïdes*, but the species arranged under these two genera have not all their characters. The *Gob. Gronovii*, Gm., Marcgr., 153, does not belong to this family, it is our genus NOMEUS of the family of the *Scomberoïdes*. The *Gobiomoroïde pison*, *Gob. pisonis*, Gm., *Amore pixuma*, Marcgr. 166; *Eleotris*, 1, Gron., Mus. 16, has not the character of this genus, for it has two dorsals both in the fig. of Marcgr., and in the description of Gronovius: by its ventrals it is an Eleotris.

Bloch, Ed. Schn., p. 65, separates from the Gobies, and makes the genus *Eleotris* different from that of Gronovius which bears the same name, of those species whose ventrals are merely united like a fan without being infundibuliform; but in those which I have examined, the membrane which unites the external edges in front is merely somewhat shorter in proportion, which has prevented it from being observed, and for this reason I leave them among the Gobies.

E. dormitatrix, Cuv.; *Platycephalus dormitator*, Bl., Schn. (The Sleeper.) Tolerably large, with a depressed head, inflated cheeks, and fins spotted with black. From the marshes of the Antilles.(1)

They are also found in Senegal,(2) and in India.(3)

A small species is taken on the coast of the Mediterranean, *Gobius auratus*, Riss., of a golden colour, with a black spot on the base of the pectoral.(4)

CALLIONYMUS, Lin.(5)

Fishes of this genus have two strongly marked characters, one in their branchiæ, which have but a single aperture, consisting of a hole on each side of the nape, and another in their ventrals, which are placed under the throat, are separate, and larger than the pectorals. Their head is oblong and depressed, their eyes approximated and directed upwards, their intermaxillaries very protractile, and their preopercula elongated behind and terminating in some spines. Their teeth are small and crowded, but there are none in the palate. They are pretty fishes with a smooth skin, whose anterior dorsal, supported by a few setaceous rays, is sometimes very elevated. The second dorsal is elongated as well as the anal. They have the same post-anal appendage as the preceding ones. There is no cul-de-sac to their stomach, and the natatory bladder and cæca are wanting. One of them is common in the British Channel, the

Call. lyra, L.; Bl. 161; Lacep. II, x, 1. The first dorsal elevated, and the second ray extended into a long filament; orange spotted with violet. The *Call. dracunculus*, Bl. 162, only differs from it in the first dorsal being short and without the filament; several authors consider it the female. Some others are found in the Mediterranean, such as

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(1) It is the *Gobiomore dormeur*, Lacep. Add the *Guavina*, Parr., pl. xxxix, f. 1; the *Amore guaçu*, Marcgr. 66;—the *Amore pixuma*, Id. Ib., or *Gob. pisonis*, Gm.

(2) I infer this from a note attached to a dried skin presented to the Museum by Adanson, and which is specifically different from the preceding ones.

(3) The *Gob. strigatus*, Brouss. Dec., pl. 1, or *Gobiomore taiboa*, Lacep. cop. Ency. Method., f. 138;—the *Eleotris noir*, Quoy and G., op. cit. pl. lx, f. 2, and the *Sciæna macrolepidota*, Bl. 298, and *maculata*, Id. 299, 2, which constituted my former genus *Prochilus*, which must be suppressed.

(4) It is an *Eleotris* and not a Goby.

(5) *Callionymus* (beautiful name), one of the names of the *Uranoscopus* among the Greeks. Linnæus applied it to the present genus.

Call. lacerta, Cuv.; Rond. 304, and not so well, *Call. pusillus*, Laroche, Ann. Mus. XIII, xxv, 16. First dorsal low; the second much elevated in the male; silvery points, and white, black-edged lines on the flanks; the caudal long and pointed.(1) The

TRICHONOTUS, Schn.

Appears to be a mere Callionymus, with a very elongated body, whose single dorsal and anal have a corresponding length. The two first rays of the dorsal, extended into long setæ, represent the first dorsal of the Common Callionymus. The branchiæ, however, are said to be well cleft.(2)

COMEPHORUS, Lacep.

First dorsal very low; the muzzle oblong, broad and depressed; gills much cleft, with seven rays; very long pectorals, and what constitutes their distinguishing character, a total absence of ventrals.

But one species is known, from lake Baikal, the *Callionymus baicalensis*, Pall. Nov. Act. Petrop. I, ix, 1; a foot long, of a soft fatty substance, from which oil is obtained by compression. It is only to be had when dead, after a storm.

PLATYPTERUS, Kuhl and Van Hassel.

The broad and separated ventrals of a Callionymus; a short depressed head; the mouth small, and branchiæ open; scales broad; the two dorsals short and separated.(3)

It is with some hesitation that I close this family with a genus which will one day probably form the type of a separate family; I mean the

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(1) The *Call. diacanthus*, Carmich., Lin. Trans. XII, pl. xxvi, does not appear to me to belong to this genus. The *Call. indicus*, Lin. is nothing more than the *Platycephalus spatula*, Bl. 424. Add, *Call. cithara*, Cuv.;—*C. jaculus*, and other new Mediterranean species; and of species foreign to Europe, the *C. orientalis*, Schn., pl. vi; *C. ocellatus*, Pall. VIII, pl. iv, f. 13;—*C. sagitta*, Id. Ib., f. 4, 5; and some others to be described in our Icthyology.

(2) *Trichonotus setigerus*, Bl., Schn., pl. 39.

(3) *Platyptera melanocephala*, K., and V. H.; *Pl. trigonocephala*, Id., two fishes from India to be described in our Icthyology.

Chirus, Stell.—Labrax, Pall.

Fishes with a tolerably long body, furnished with ciliated scales; a small unarmed head; slightly cleft mouth, provided with small, unequal, conical teeth; the spines of whose dorsal are almost always very delicate, the fin itself extending the whole length of the back. Their distinguishing character consists in several series of pores, similar to the lateral line, or, as it were, in several lateral lines. There are no cæca to the intestines, and they frequently have an appendage on the eye-brow, as is the case with certain Blennies, but their ventrals consist of five soft rays, as usual. The species known are from the sea of Kamschatka.(1)

FAMILY XIII.

PECTORALES PEDICULATI.

This family consists of certain Acanthopterygii whose carpal bones are elongated so as to form a sort of arm, which supports their pectorals. It comprises two genera, which are closely approximated although authors have generally placed them at a distance from each other, and which are closely allied to the Gobioides.

Lophius, Lin.(2)

The general character of this genus, independently of the semi-cartilaginous skeleton and the naked skin, consists in the pectorals being supported by two arms, as it were, each of which is formed of two bones that have been compared to the radius and ulna, but which in reality belong to the carpus, and which in this genus are longer than in any other; in the ventrals being placed very far before these pectorals; in opercula and branchiostegous rays enveloped in the skin, and, finally, in the only opening of the gills being a hole situated behind the said pectorals. They are voracious fishes, with a wide stomach and short intestine, which survive a long time out of water, on account of the smallness of their branchial apertures.

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(1) *Labrax lagocephalus;—L. decagrammus;—L. superciliosus;—L. monopterygius;—L. octogrammus;—L. hexagrammus;* all described and figured by Pallas, Mem. Acad. Petersb. vol. XI, 1810.

(2) *Lophius*, a name made by Artedi, from λοφια (*pinna*), on account of the crests of their head. The ancients called them βατραχοι, and *Rana* or Frog.

Lophius, Cuv.

The head excessively large in proportion to the rest of the body, very broad and depressed, and spinous in many places; the mouth deeply cleft and armed with pointed teeth; the lower jaw furnished with numerous cirri; two distinct dorsals, some rays of the first separated before and movable on the head, where they rest on a horizontal interspinal; the branchial membrane forming a very large sac, opening in the axilla, and supported by six very long rays; the operculum small. There are but three branchiæ on each side. It is asserted that these fishes live in the mud; where, by agitating the rays of their head, they attract smaller ones, who take the often enlarged and fleshy extremities of those rays for worms, and thus become their victims; it is also said that they can seize or retain them in their branchial sac.(1) They have two very short cæca, near the origin of the intestine, but no natatory bladder.

> *L. piscatorius*, L.; Bl., 87; *Sea-Devil; Galanga*, &c. (The Angler.) A large fish, of from four to five feet in length, inhabiting the seas of Europe, whose hideous figure has rendered it celebrated.
>
> *L. parvipinnis*, Cuv. A very similar species that is found in the same seas; its second dorsal however is lower, and it has only twenty-five vertebræ, while the piscatorius has thirty.(2)

Chironectes.—Antennarius, Commers.

Four rays on the head, as in Lophius; the first of which is slender, and frequently terminating in a tuft; the succeeding ones, augmented by a membrane, are sometimes much enlarged, and at others united into a fin. The body and head are compressed; the mouth cleft vertically: the only opening of the branchiæ, which are furnished with four rays, is a canal and a small hole behind the pectoral; the dorsal occupies nearly the whole length of the back. The entire body is frequently provided with cutaneous appendages; there are four branchiæ; the natatory bladder is large, and the intestine moderate, and without cæca. These fishes, by filling their enormous stomachs with air, are enabled to expand their belly like a balloon; on land, their pairs of fins enable them to creep almost like small quadrupeds, the pectorals, from their position, performing the functions of hind feet, and thus they live out of water for two or three days. They are found in the seas of hot climates, and several of them were confounded by Linnæus under the name of *Lophius histrio*.(1)

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(1) Geoff., Ann. du Mus., X, p. 180.

(2) We are ignorant whether it is the *Lophius budegassa* of M. Spinola and Risso or not, that species being described as more fawn-coloured and varied than the common one.

Add the *Loph. setigerus*, Vahl, Soc. Hist. Nat. Copenh. IV, p. 215, and pl. iii, f. 5 and 6, improperly named *viviparus* by Bl., Syst., pl. xxxii.

N.B. The *Baudroye Ferguson*, Lacep., Phil. Trans. LIII, xiii; the *Lophius cornubicus* of Sh, Borlase, Corn., xxvii, 6; the *L. barbatus*, Gmel., Act. Stockh., 1779, fasc. III, pl. iv, are merely altered specimens of the *piscatorius;* the *L. monopterygius*, Shaw, Nat. Misc., 202 and 203, is a Torpedo disfigured by the stuffer.

We might distinguish those species in which the second and third rays are united in a fin which is even sometimes joined to the second dorsal.(2)

MALTHE, CUV.,

The head excessively enlarged and flattened, chiefly by the projection and volume of the suboperculum; the eyes forwards; the snout salient, like a small horn; the mouth, beneath the snout, moderate and protractile; the branchiæ supported by six or seven rays, and opening on the dorsal surface by a hole above each pectoral; a single, small, and soft dorsal; the body studded with osseous tubercles, with cirri the whole length of its sides; but there are no free rays on the head. The cæca and natatory bladder are wanting.(3)

BATRACHUS, Bl. Schn.—BATRACOIDES, Lac.(4)

The head horizontally flattened, broader than the body; the mouth well cleft; operculum and suboperculum spinous; six branchial rays; the ventrals narrow, inserted under the throat, and formed of but three rays, the first of which is elongated and widened; pectorals supported by a short arm, the result of the elongation of the carpal bones. The first dorsal is short, and supported by three spinous rays; the second is soft and long, as well as that of the anus which corresponds to it. The lips are frequently furnished with filaments. Those which have been dissected present a stomach resembling an oblong sac, and short intestines, but there is no cæcum. The forepart of the natatory bladder is deeply bifurcated. They keep themselves hidden in the sand, to surprize their prey, like the Lophius, &c.; the wounds inflicted by their spines are reputed dangerous. They are found in both oceans.

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(1) Species. *Chiron. pictus*, Cuv., or *Lophius histrio-pictus*, Bl., Schn., 142, or Mem. Mus. III, xvi, 1;—*Ch. tumidus*, Cuv., Mus. Ad. Fred., p. 56;—*Ch. lævigatus*, Cuv., or *L. gibbus*, Mitch. op. cit. I, vi, 9;—*Ch. marmoratus*, or *L. Hist. Marm.*, Bl., Schn., 142, Klein, Misc., III, iii, 4, or *L. raninus*, Tiles., Mem. Nat. Mosc., II, xvi;—*Ch. hispidus*, Bl., Schn. 143, Mém. Mus., III, xvii, 2;—*Ch. scaber*, Ib., XVI, 2, or *Guaperva*, Marcgr., 150 (but not the figure), *L. histrio*, Bl. pl. cxi;—*Ch. biocellatus*, Cuv., Mém. Mus. III, xvii, 3;—*Ch. ocellatus*, or *L. histr. ocell.*, Bl., Schn., 143, Parra, I;—*Ch. variegatus*, or *L. chironecte*, Lacép., I, xiv, 2, or *L. pictus*, Shaw, Gen. Zool. V, part II, pl. clxv;—*Ch. furcipilis*, Cuv., Mém. Mus. III, xvii, 1; Laet., Ind. Occ., 574, a figure given for the *guaperva*, Marcgr. 150;—*Ch. nummifer*, Cuv., Mém. Mus. III, xvii, 4;—*Ch. Commersonii*, Cuv., Lacép. I, xiv, 3, and very badly, Ren., I, xliii, 212;—*Ch. tuberosus*, Cuv.

(2) *Ch. punctatus*, Cuv., Mém. Mus. III, xviii, 2, and Lacép. Ann. Mus. IV, lv, 3;—*Ch. unipinnis*, Cuv., Mem. Mus. III, xviii, 3, Lacep. Ann. Mus. III, xviii, 4.

(3) *Lophius vespertilio*, L., Bl., 110;—*Malth. nasuta*, Cuv., Seb. I, lxxiv, 2;—*M. notata*, Cuv.;—*M. angusta*, Cuv., the skeleton of which is found in Rosenthal, Pl. Icthy., t. XIX, 2;—*M. truncata*, Cuv.;—*M. stellata*, Cuv., or *Lophius stellatus*, Vahl., Mem. Soc. Hist. Nat. Copenh., IV, pl. iii, f. 3, 4, the same as the *Lophie faujas*, Lacép., I, xi, 2, 3, and the *Lophius ruber*, Til., Krusenstein's Voy., LXI.

(4) Βατραχος, frog, from their broad head.

Some of them have a smooth and fungous skin and a cutaneous appendage over the eye.(1)

Others are covered with scales, and have no appendage over the eye.(2)

We might distinguish those in which the scales and cirri are wanting, but which have lines of pores pierced in the skin,(3) and hooked teeth in the lower jaw.

FAMILY XIV.

LABROIDES.

This family is easily recognized; the body is oblong and scaly; a single dorsal is supported in front by spines, each of which is generally furnished with a membranous appendage; the jaws are covered with fleshy lips; there are three pharyngeals, two upper ones attached to the cranium, and a large lower one, all three armed with teeth, now en pavé and then pointed or laminiform, but generally stronger than usual; an intestinal canal either without cæca, or with two very small ones, and a strong natatory bladder.

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(1) *Batr. tau*, (*Gadus tau*, L.), or *Lophius bufo*, Mitch., or *Batrachoides vernul*, Lesueur, Mém. Mus., V, xvii;—the *Batr. varie*, Id. Ac. Nat. Sc. Phil.;—*Batr. grunniens* (*Cottus grunniens*, L.), Bl., 179, Sch. III, xxiii, 4;—*Batr. gangene*, Buch., XIV, 8;—*Battr. dubius*, Cuv., or *L. dubius*, J. White, 265, Nieuhof, Ap., Will., Ap. IV, 1;—*Batr. 4-spinis*, Cuv., or *Batr. diemensis*, Lesueur, Ac. Nat. Sc. Philad.

(2) *Batr. surinamensi*, Bl., Schn., pl. vii, given as the *Tau*, Lacép., II, xii, 1;—*B. conspicillum*, Cuv., or the pretended *Batr. tau*, Bl., pl. lxvii, f. 2 and 3.

(3) *Bat. porosissimus*, Cuv., *Niqui*, Marcgr., 178, or the second *Niqui* of Pison, 295. N.B. The first *Niqui* of Pison, 294, is a badly copied figure from the collection called Mentzel's, to which the engraver has added scales.

LABRUS, Lin.

A very numerous genus of fishes which strongly resemble each other in their oblong form; their double fleshy lips, from which they derive their name, one adhering immediately to the jaws and the other to the suborbitals; their crowded branchiæ with five rays; their conical maxillary teeth, the middle and anterior of which are the longest, and their cylindrical and blunt pharyngeal teeth arranged en pavé, the upper ones on two large plates, the lower on a single one which corresponds to the two others. Their stomach does not form a cul-de-sac, but is continuous with an intestine without cæca, which after two inflexions, terminates in a large rectum. They have a single and strong natatory bladder.

LABRUS, *properly so called.*

The opercula and preopercula without spines or dentations; the cheek and operculum covered with scales; the lateral line straight, or nearly so. The seas of Europe produce several species the variation of whose colours rarely allows them to be clearly distinguished.(1)

L. maculatus; Duham. Sect. IV, pl. ii, f. 1; *Lab. maculatus,* Bl. 284?; *Lab. bergilta,* Ascan. Ic. I. From a foot to eighteen inches in length; twenty or twenty-one dorsal spines; blue or greenish above, white beneath; every where chequered with fawn colour, which sometimes becomes general.(2)

L. variegatus, Gm.; *L. lineatus,* Penn. XLV, cop. Encycl. 402. One or more clouded, irregular dark bands along the flank, on a ground more or less reddish; sixteen or seventeen spines in the dorsal, which is marked with a dark spot in front.(3)

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(1) With respect to these fishes we can neither trust to the figures of Bloch nor to the descriptions of Gmelin.

(2) The *Vielle tachetée* was indicated by Lacép., under the name of *Labre neustrien.* It is possible that the *Labrus maculatus,* Bl., 294, was a bad figure of it, taken from a dried specimen whose colours had been entirely changed; the *Labrus tinca,* Shaw, Nat. Misc., 426, and Gen. Zool., IV, pl. ii, p. 499, is a beautiful variety, red spotted with white, but is not the *tinca* of Lin.; the *Lab. ballan,* Penn., 44, cop. Encycl., 400, is the fawn coloured variety; the *L. comber,* Penn., XLII, cop. Encycl., 405, is a red variety, with a suite of white spots along the flank.

(3) The only good drawing of this fish is that of Pennant; I suspect the *Labr.*

L. carneus, Bl.; *L. trimaculatus*, L. Bl., 289. Reddish; three black spots on the hind part of the back.

L. turdus, Gm.; Salvian. 87. Green, more or less distinct; scattered spots sometimes resembling mother of pearl, sometimes brown; frequently a nacred band along the flank.(1)

L. merula, Gm.; Salvian. 87. Black, more or less bluish; the dorsal of these three species contains from sixteen to eighteen spines. The last one is only obtained from the Mediterranean.(2)

CHEILINUS, Lacep.

Differs from Labrus, properly so called, in the interruption of the lateral line opposite the end of the dorsal; it recommences a little lower down. The scales on the end of the tail are large and somewhat envelope the base of the caudal. They are beautiful fishes from the Indian Ocean.(3)

LACHNOLAIMUS, Cuv.

The general characters of a true Labrus, but the pharyngeals

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vetula, Bl., 293, to be an altered figure of the same; it is, in the nuptial season, the *Turdus perbelle pictus*, of Willugh., 322, and the *Sparus formosus*, Shaw, Nat. Misc.

(1) I am of the opinion that the *Lab. viridis* and the *Lab. luscus*, Lin., are varieties of this turdus, which is subject to great changes of colour. The *Lab. viridis*, Bl., 282, is a Julis, Cuv., and differs from that of Linnæus.

(2) Add: *Lab. americanus*, Bl., Schn., or *Tautoga*, Mitch., pl. iii, 1;—*L. herissé*, Lacép., III, xx, 1;—*L. large queue*, Id., III, ix, 3;—*L. deux croissants*, Id., III, xxxii, 2;—*L. Diane*, Id., III, 1.

N.B. The *Cheil. auratus*, Commers., Lacép., IV, 433, or the *Labrus inermis*, of Forsk, (*L. Hassec*, Lacép.) and Voy. Freycin., Zool., pl. 54, No. 2, is merely a very slender Labrus with flexible dorsal spines.

(3) The *Cheiline trilobé*, Lacép. III, xxxi, 3, the same as the *Sparus chlorurus*, Bl., 260;—*Sparus radiatus*, Bl., Schn., 56;—*Sparus fasciatus*, Bl., 257, which is also the *Labre cunéacanthe*, Lacép., III, p. 490;—*Labrus fasciatus*, Bl., 290, which is also the *Labre malapteronote*, Lacép., III, xxxi, 1; the figure to which should be referred the description of the *Labre fuligineux*, Id. III, p. 493, but not the fig., which is that of the *Mesoprion uninotatus*;—*Labrus melagaster*, Bl., 296, 1;—*L. diagramme*, Lacép., III, 1, 2;—*L. lunula*, Forsk. N.B. The *Labrus scarus*, L., (*Cheiline scare*, Lacép.) was merely established by Artedi and Linnæus on an equivocal description of Belon, Aquat., lat. ed. p. 239, and Obs. p. 21, where it is impossible to ascertain even the genus of the fish of which he speaks. The fig. and description of Rondelet, lib. VI, cap. II, p. 164, usually quoted with those of Belon, refer to a totally different fish of the genus Sparus The true *Scarus* of the Greeks is another fish, as we shall soon see

have no teeth en pavé, except at their posterior part, the remainder of their extent as well as a part of the palate being covered with a villous membrane. These fishes are recognized at sight by the first spines of their dorsal, which rise in long flexible filaments. The species known are from America.(1)

Julis, Cuv.

The head entirely smooth and without scales; the lateral line forming an elbow opposite the end of the dorsal. Some species are found in the seas of Europe.

J. vulgaris; Labius julis, L., Bl. 287, f. 1. A small fish remarkable for its beautiful violet hue, relieved on each side by a zigzag line of a rich orange colour, &c. It varies greatly, is the best known of the Mediterranean species, and is also found in the ocean.

J. Gioffredi, Risso. A fine scarlet; a black spot at the angle of the operculum; a gilt band along the flanks; inhabits both the Mediterranean and the ocean.

J. tursica, Risso. A rich green; a red streak on each scale; the head red, with blue lines; one or more vertical bands of a turquoise blue; a black spot on the pectoral; tail shaped like a crescent; one of the most beautiful fishes of the Mediterranean.

Hot climates produce numerous species of this fish, most of which are splendidly and variously coloured.

Some of them have a rounded or truncated caudal;(2) the first dorsal rays of others(3) are drawn out into filaments.

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(1) *Lachnolaimus suillus*, Cuv.; Catesb., II, xv;—*L. caninus*, Cuv., Parra, pl. iii, f. 2.

(2) Species with a round or truncated tail; *Labre parterre*, Lacép., III, xxix, 2, the same as the *Echiquier*, Id., p. 493;—*L. trilobé*, Id. III, iv, 3;—*L. teinioure*, Lac., III, xxix, 1, the same as his *Spare hémisphère*, III, xv, 3, and probably as his *Spare brachion*, III, xviii, 3;—*L. ceinture*, Id., III, xxviii, 1;—*Labrus brasiliensis*, Bl., 280;—*L. macrolepidotus*, Bl., 284, 2;—*L. guttatus*, Bl., 287, 2;—*L. cyanocephalus*, Bl., 286;—*L. malapterus*, Bl., 285;—*L. chloropterus*, Bl., 288;—*L. bivittatus*, 284, 1;—*Julis crotaphus*, Cuv., Parra, XXXVII, 1;—*L. albovittatus*, Kæhlr., Nov. Com. Pet. IX, 458, and Encycl., 399;—*L. mola*, Cuv., Russ., II, 120;—*L. margaritiferus*, Cuv., or *Gir. Labiche*, Voy. Freycin. Zool. pl., f. 3;—*L. ornatus*, Carmich. Lin. Trans. XII, xxvii.

(3) The *Girelle Gaymard*, Voy. Freycin., pl. liv, which is also the *Sparus cretus*, Forst., and Renard, part. I, pl. ii, No. 11, and part II, 160. N.B. The *Coris* of M. de Lacépede established by that naturalist from the drawings of Commerson have turned out to be fishes of the present genus with truncated tails, the artist having neglected to express the separation of the operculum from the preoperculum. The *Coris angulé*, III, iv, 2, appears to be the *Labrus malapterus*, and the

Others again have a crescent-shaped or bifurcated tail.(1)

Anampses, Cuv.

All the characters of a Julis, with the exception of two flat teeth in the jaws, which project from the mouth and curve outwards.

But one or two species are known; from the Indian Ocean.(2)

Crenilabrus, Cuv.

We separate these fishes from the Lutjanus of Bloch, in order to arrange them in their proper place. They have all the characters, external and internal, of a true Labrus, and only differ in the dentation of the border of their preoperculum.

Some of them are taken in the northern seas; such as the *Lutjanus rupestris*, Bl. 250; fawn coloured, with clouded, blackish vertical bands. *Lutjanus norvegicus*, Id., 256; brownish, irregularly spotted and marbled with deep brown. *Labrus melops;* orange, spotted with blue; a black spot behind the eye; pl. xxi, f. 1. *Labrus exoletus*, or *L. palloni*, Risso; remarkable for the five spines of its anal.(3)

The Mediterranean produces a great number which are decorated with the most beautiful colours; the most splendid is the *Labrus lapina*, Forsk.; silvery, with three broad longitudinal bands formed of vermilion dots, yellow pectorals, the ventrals blue, &c.(4) They abound also in the seas of hot cli-

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Coris aigrette, III, iv, 1, must be closely allied to the *Girelle Gaymard*. M. de Lacépede has also named *Hologymnoses* some of these fishes, in which the scales of the body, smaller than usual, are concealed during life by a thick epidermis; but the scales which do not appear in the drawing of Commerson, engraved Lacép., III, pl. 1, f. 3, are very visible in the dried specimen deposited in the museum: that genus must therefore be included in *Julis*, together with the *Demi-Disque*, III, pl. vi, f. 1; the *Annelé*, Ib., pl. xxviii, and the *Cerclé*, which at least are closely allied to it.

(1) Species with crescent-shaped or forked tails: *Labre hébraïque*, Lacep. III, xxix, 3:—*Labrus bifasciatus*, Bl. 283:—*L. lunaris*, L., Gron., Mus., II, vi, 2, cop. Encycl., 196;--*L. lunaris*, Bl., 281, which is different and may possibly be nothing more than an altered *Julis turcica;*—*L. viridis*, Bl., 282;—*L. brasiliensis*, Bl., 280; *Julis cæruleocephalus*, Cuv., or *Girelle Duperrey*, Voy. Freycin. Zool. pl. f. 333;—*L. argenté*, Lac., III, xviii. N.B. The *Scarus gallus*, Forsk., is probably the same as the *Lab. lunaris*.

(2) *Labrus tetrodon*, Bl., Schn., 263;—*Anampses Cuvieri*, Quoy and Gaym., Voy. Freycin., Zool., pl. lv, f. 1.

(3) Add, *Lab. gibbus*, Penn., xlvi, copied Encycl., 403:—*Lutj. virescens*, Bl., 254, 1.

(4) Risso describes several in his first edition under the name of *Lutjanus;* in the second he adopts our genus Crenilabrus, and carries the number of species

mates,(1) and several species hitherto left among the Labri, should be placed here.

Coricus, Cuv.

All the characters of a Crenilabrus; in addition to which, the mouth is nearly as protractile as that of an Epibulus.

The species known are small, and from the Mediterranean.(2) We must remove the following fishes from the genus Sparus, in order to place them near Coricus or Cheilinus.

Epibulus, Cuv.

Remarkable for the excessive protractility of their mouth, which by a see-saw motion of their maxillaries, and the sliding forwards of their intermaxillaries, instantly becomes a kind of tube. They employ this artifice to capture the small fry which pass within reach of this singular instrument; it is also resorted to by the Corici, Zei and Smares, according to the greater or less protractility of their jaws. The entire body and head of an Epibulus is covered with large scales, the last range of which even encroaches upon the anal and caudal fins, as is the case in Cheilinus; the lateral line is similarly interrupted, and, as in the latter and in Labrus, there are two long conical teeth in front of each jaw, followed by smaller bluntones; we have not had an opportunity of observing those in the pharynx.

But a single species is known; *Sparus insidiator*, Pal., Spic. Zool. Fasc. VIII, pl. v, 1, of a reddish colour. From the Indian Ocean.

Clepticus, Cuv.

A small cylindrical snout, which is suddenly protruded like that of an Epibulus, but which is not as long as the head; the small teeth

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to twenty-eight; but all his species are not distinct, and his synonymes are sometimes uncertain. His species should be compared with those of Brunnich, Bloch, &c. The *Lab. venosus*, Brunn.;—*L. fuscus*, Brunn.;—*L. unimaculatus*, Brunn.;—*Lutjanus rostratus*, Bl., 254, 2, perhaps the *Cr. tinca*, Risso;—*Lab. 5-maculatus*, Bl., 291, 2, is the *Crenil. Roissal*, Risso;—*Lutj. bidens*, Bl., 251, 1;—*Lab. mediterraneus*, Brunn.;—*Lab. rubens*, Brunn.;—*Lab. perca*, Brunn.;—*Lab. spalatensis*, Br.;—*Lab. tinca*, Brunn.;—*Lab. ocellatus*, Forsk., or *olivaceus*, Brunn., &c.

(1) At the head of the list should be the *Lutjanus verres*, Bl., 255, the same as his *Bodianus bodianus*, 223, and as the *Perro colorado*, Parra, pl. III, f. 1.—Add, *Lutjanus notatus*, Bl., 251, 2;—*L. violaceus*, or *L. Linkii*, Bl., 252;—*L. virescens*, Bl. 254, 1;—*Lab. burgal*, Schœpp., or *L. chogset*, Mitch., III, 2?—*L. chrysops*, Bl., 248.

(2) The *Lutjanus viridens*, and the *L. Lamarkii*, Riss., first edition. In the second he adopts this subgenus and adds to it a *Coricus rubescens*.

barely perceptible to the touch; the body oblong, head obtuse, and the lateral line continuous; the dorsal and anal enveloped by scales nearly to the summit of the spines.

C. genizara, Cuv.; Parra. pl. xxi, f. 1. The only species known; of a purple red. From the Antilles.

GOMPHOSUS, Lacep.—ELOPS, Commers.

Labroides, with an entirely smooth head, as in Julis; but owing to the prolongation of the intermaxillaries and maxillaries, which are united by the teguments as far as the small opening of the mouth, the muzzle is made to resemble a long thin tube.(1)

They are taken in the Indian Ocean, and the flesh of certain species is held in the highest estimation.(2)

XIRICHTHYS, Cuv.

These fishes resemble a Labrus as to form, but are much compressed; the front descends suddenly towards the mouth in a trenchant and almost vertical line, formed by the æthmoid and the ascending branches of the intermaxillaries. Their body is covered with large scales; the lateral line is interrupted; the jaws are armed with a range of conical teeth, the central ones longest; the pharynx is paved with hemispherical teeth; the intestinal canal is continuous with two flexures without cæca; no cul-de-sac to the stomach; a tolerably long natatory bladder. Until we arranged them otherwise, they were always placed by naturalists among the Coryphænæ, from which they greatly differ, both internally and externally. They approximate most to Labrus, only differing in the profile of the head.(3) The greater number have a naked head. Such is

X. novacula; Coryphæna novacula, L.; Rondel.; 146, Salv. 117. Red, variously striped with blue. The flesh is esteemed.(4)

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(1) *Gomphosus viridis*, Cuv., or *G. Lacépede*, Quoy and Gaym. Voy. Freycin. Zool. pl. lv, f. 2;—*G. cæruleus*, Lacép. III, pl. v, f. 1, or *Acarauna longirostris*, Sevastianof, Nov. Act. Petrop. xiii, t. XI;—*G. variegatus*, Lacép., Ib. f. 2.

Gomphosus, from γομφος, *cuneus*, *clavus*.

(2) Renard, Poissons de la mer des Indes, part II, pl. xii, f. 109. Commerson, however, says that the *cæruleus* is but indifferent food.

(3) The sharp edge of the head of the Coryphænæ is owing to the interparietal crest; their scales are small and soft; their cæca numerous. See Mém. du Mus., II, 324.

(4) The *Coryph. lineolata*, Rafin., Caratt., 33, does not differ from the *novacula*, but the *Novacula coryphæna*, of Risso, is nothing more than the Centrolophus. The *Coryph. cærulea*, Bl., 176, is a Scarus.—Add, *Cor. psittacus*, L., and some new species

Some of them have a scaly cheek,(1) and others are distinguished by small scales.(2)

Chromis, Cuv.(3)

The lips, protractile intermaxillaries, pharyngeals, dorsal filaments, and port of a Labrus; but the teeth of the pharynx and jaws resemble those of a card, and there is a range of conical ones in front. The vertical fins are filamentous, those of the belly being even frequently extended into long threads; the lateral line is interrupted; the stomach forms a cul-de-sac, but has no cæca.

C. vulgaris; Sparus chromis, L. Rondel., 152. *The Common* or *Black Coracinus* of the ancients. A small chesnut-brown fish, taken by thousands in the Mediterranean.

C. niloticus; Lab. niloticus, Hasselq., 346; Sonnini, pl. xxvii, f. 1; the *White*, or *Egyptian Coracinus* of the ancients.(4) Found in the Nile; it is two feet long, and is considered the best fish of Egypt.

Cychla, Bl. Schn.

Teeth, small and crowded, forming a broad band, and differing from Chromis in this, as well as in the greater elongation of the body.(5)

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(1) *Coryphæna pentadactyla*, Bl. 173, or *Blennius maculis*, 5, &c. Ankarstrom, Stockh. Mem. pl. iii, f. 2. Linnæus has confounded it with the five-toed fish of Nieuhof, Willbughb, App. pl. viii, f. 2, which is a mere Pilot-fish, thereby inducing M. de Lacépede to make his genus *Hemipteronotus* of it, whose characters by no means correspond to this Xirichthys.

(2) *Rason l'écluse*, Quoy and Gaym. Voy. Freycin., Zool., pl. lxv, f. 1.

(3) Χρομις, χρεμις, χρεμη, Greek names of an unascertained fish.

(4) Add, *Labrus punctatus*, Bl., 295, 1;—*Labre filamenteux*, Lac., III, xviii, 2;—*Lab.* 15-*épines*, Id., Ib. XXV, 1;—*Sparus surinamensis*, Bl., 277, 2;—*Chætodon suratensis*, Bl., 217?;—*Perca bimaculata*, Bl., 310, 1.

(5) I strike out many species from the genus Cychla as constituted by Bloch, but I leave there, *C. saxatilis*, Bl., 309;—*C. ocellaris*, Bl., Schn. pl. lxvi;—*C. argus*, Valenc., App. Humb. Obs. Zool. tom. II, p. 109;—perhaps the *C. brasiliensis*, Bl., 310, 2, and new species. But the *C. erythrura*, Bl., 261, and the *C. argyrea*, are Gerres; the *C. cuning*, a Cæsio; the *C. brama*, a Cantharus; the *C. macrophtalma*, Bl., 268, the *C. japonica*, Id., 277, 1, the *C. cynodon*, Id., 278, 1, belong to Dentex, the *C. surinamensis*, Id., 277, 2, and the *C. bimaculata*, Id., 310, 1, to Chromis, the *C. guttata*, Bl., 312, the *C. maculata*, Id., 313, the *C. punctata*, Id., 314, to Serranus, or, according to the system of Bloch, to Bodianus. The *C. pelagica* is the Caranxomore of Lacép. or the *Coryphæna pelagica*, L. It is easily seen that Bloch was quite as unfortunate in the construction of his genus Cychla, as in that of Grammistes.

The *Hiatulæ* would be Labri without an anal fin; but a single species, however,

Plesiops, Cuv.

A Chromis with a compressed head, approximated eyes, and extremely long ventrals.

Malacanthus, Cuv.

The general characters of a Labrus, and similar maxillary teeth, but the pharyngeal teeth are like those of a card, as in Chromis, &c.; the body is elongated, the lateral line continuous, and the operculum terminated by a small spine; the long dorsal has but a small number of spines; the anterior ones thin and flexible.

> **A species is found in the French Antilles, called by the inhabitants *Vive;* it is the *Coryphæne Plumier*, Lacep., IV, viii, 1; yellowish, irregularly and transversely streaked with violet;(1) a crescent-shaped tail.**

Scarus, Lin.

A genus of fishes with remarkable jaws (that is, their intermaxillary and premandibular bones), which are convex, rounded, and furnished with teeth, arranged like scales upon their edge, and upon their anterior surface; these teeth succeed each other from behind forwards, so that those of the base are the newest, and in time form a row on the edge. Naturalists have erroneously thought that the bone itself was naked; besides, during the life of the fish, its jaws are covered by fleshy lips, but there is no double one adhering to the suborbital. They have the oblong form of a Labrus, large scales, and an interrupted lateral line; they have three pharyngeal plates, two above and one below, furnished with teeth as in a Labrus; but these teeth are transverse blades, and not like rounded paving stones.

> A species, blue or red, according to the season, is found in the Archipelago, which is the *Scarus creticus*, Aldrov., Pisc., p. 8; and which late researches have convinced me is the *Scarus*, so highly celebrated among the ancients; the same that Eli-

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is quoted, (from Carolina,) and that merely from a note by Garden, which requires confirmation (*Labrus hiatula*, L.). It is not easy to imagine why Bloch, Schn., p. 481, placed it in *Trachypterus*.

(1) N.B. This fig. taken from Plumier, was altered by Bloch to represent his *Coryphæna Plumieri*, pl. 175. Lacépède gives a more exact one. It is also the *Matejuelo blanco* of Parra, XIII, 1, or the *Sparus oblongus*, Bl., Schn., 283.

Add the ***Tubleu*** of the Isle of France, or *Labre large raie*, Lacép. III, xxviii, 2, the description of which is found, tome IV, p. 204, under the name of *Tænianote large raie*.

pertius Optatus, commander of a Roman fleet, during the reign of Claudius, went to Greece in search of, for the purpose of distributing it through the sea of Italy. It is an article of food in Greece at the present day.(1)

Numerous species are found in the seas of hot climates. The form of their jaws and the splendour of their colours have caused them to receive the vulgar appellation of *Parrot-fishes.*

Some of them have a crescent-shaped tail,(2) and of these a few with a singularly gibbous forehead.(3)

In others it is truncated.(4) We separate from Scarus the

CALLIODON, Cuv.

Where the latter teeth of the upper jaw are separate and pointed, and where there is an inner range of much smaller ones on the same;(5) and the

ODAX, Cuv.

Which approaches a true Labrus in the inflated lips and continuous lateral line; the jaws, composed like those of a Scarus, are however flat and not gibbous, and are covered by the lips; the pharyngeal teeth are en pavés, as in Labrus.(6)

FAMILY XV.

FISTULARIDÆ.

The fishes of this family are characterized by a long tube, in the fore-part of the cranium, formed by the prolongation of the æthmoid, vomer, preopercula, interopercula, pterygoidals and tympanals, and at the extremity of which is the mouth, composed as usual of the intermaxillaries, maxillaries, and the palatine and mandibulary bones. Their intestine has neither great inequalities nor many folds, and their ribs are short or wanting.

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(1) N.B. It is not the *Sc. cretensis*, Bl. 228.

(2) *Scarus coccineus*, Bl., Schn., Parra, XXVIII, 2, which is the *Sparus abildgardii*, Bl., 259, and the *Spare rougeor*, Lacép., III, xxxiii, 3;—the *Great Scarus with blue jaws*, *Sc. guacamaia*, Cuv., Parra, XXVI;—the *Sc. Catesby*, Lacép., Catesb., II, xxix;—the *Sc. bridé*, Lacép., IV, 1, 2;—*Sc. chrysopterus*, Bl., Schn., 57;—*Sc. capitaneus*, Cuv., which is the *Sc. ennéacanthe*, Lacép., IV, p. 6, and his *Sc. denticulé*, Id., p. 12 and pl. 1, f. 1, and of which he gives a description annexed to the *Sc. chadri*.

(3) *Sc. loro*, Bl., Schn., Parra, XXVII, 1;—*Sc. cæruleus*, Bl., Schn., Parra, XXVII, 2, and Catesb., II, xiii, which is also the *Coryphæna cærulea*, Bl., 176, and what is more extraordinary the *Spare holocyanose*, Lacép., III, xxxiii, 2 and IV, p. 441, derives its origin from the same drawing of Plumier as this figure of Bloch.

(4) *Sc. vetula*, Bl., Schn., Parra, XXVIII, 1;—*Sc. tæniopterus*, Desmarest;—*Sc. chloris*, Parr., XXVIII, 3;—*Sc. psittacus*, Forsk.;—*Sc. viridis*, Bl.

(5) *Scarus spinidens*, Quoy and Gaym., Zool. Voy. Freycin., p. 289, and some new species.

(6) *Scarus pullus*, Forster, Bl., Schn., 288.

Some of them, the Fistulariæ, have a cylindrical body; in others, the Centrisci, it is oval and compressed.

FISTULARIA, Lin.

The name of these fishes, in particular, is derived from the tube common to the whole family. The jaws are at its extremity, slightly cleft in a nearly horizontal direction. This head, thus elongated, constitutes the third or fourth of the total length of the body, which is itself long and thin. There are six or seven rays in the branchiæ, and some bony appendages extend behind the head, upon the anterior part of the body, which they strengthen more or less. The dorsal is opposite to the anal; the stomach, resembling a fleshy tube, is continued in a straight canal, without duplicatures, to the commencement of which are attached two cæca. In

FISTULARIA, properly so called,

Or the FISTULARIA, Lacep., there is but a single dorsal, most of which, as well as of the anal, is composed of simple rays. The intermaxillaries and the lower jaw are armed with small teeth. From between the two lobes of the caudal proceeds a filament which is sometimes as long as the body. The tube of the snout is very long and depressed, the natatory bladder excessively small, and the scales invisible. They are found in the seas of hot climates in both hemispheres.(1) In the

AULOSTOMUS, Lacep.(2)

The dorsal is preceded by several free spines, and the jaws are without teeth; the very scaly and less slender body is widened and compressed between the dorsal and the anal, and followed by a short and very small tail, terminated by a common fin. The tube of the snout is shorter, thicker, and compressed; natatory bladder very large.

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(1) *Fistularia tabacaria*, Bl., 387, 1;—*Fist. serrata*, Id., Ib., 2, are from America, Marcgr., 148, Catesb., II, xvii;—*Fist. immaculata*, Commers., J. White, p. 296, f. 2, is from the Indian Ocean.

(2) *Aulostomus*, from αυλὸς and σόμα.

But a single species is known; from the Indian Ocean.(1)

Centriscus, Lin.(2)

In addition to the tubular snout of the family, the fishes of this genus have an oval or oblong (not elongated) body, compressed on the side, and trenchant beneath; branchiæ composed of but two or three slender rays; a first spinal dorsal and small ventrals behind the pectorals. The mouth is very small, and cleft obliquely; the intestine without cæca, doubled three or four times, and the natatory bladder considerable. In

Centriscus, properly so called,

The first spine of the anterior dorsal, which is placed very far back, is long and stout, and supported by an apparatus connected with the head and shoulder. They are covered with small scales, and have, besides, some broad and dentated plates on the apparatus just mentioned.

C. scolopax, L.; Bl., 123.(3) A very common species in the Mediterranean, but a few inches long and of a silvery colour.

Amphisile, Klein.

The back mailed with broad scaly plates, of which the anterior spine of the first dorsal seems to be a continuation.

Some of them even have other scaly plates on the flanks, and the spine in question placed so far behind that it thrusts the second dorsal and anal towards the lower part of the tail. Such is the *Centriscus scutatus*, L., Bl., 123, 2.

Others are intermediate between this disposition and that of a common Centriscus. Their cuirass covers but the half of the back,—*Centriscus velitaris*, Pall., Spic., VIII, iv, 8. Both these species are from the Indian Ocean.

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(1) *Fistularia chinensis*, Bl., 388.

(2) *Centriscus*, from κεντις.

(3) It is also the *Silurus cornutus*, Forsk., the *Macroramphose*, Lac.

The second division of common fishes, or that of the Malacopterygii, contains three orders, characterized by the position of the ventrals or by their absence.

ORDER II.

MALACOPTERYGII ABDOMINALES.

In this order the ventrals are suspended to the under part of the abdomen and behind the pectorals, without being attached to the bones of the shoulder. It is the most numerous of the three, and comprehends most of the fresh-water fishes. We subdivide it into five families.

FAMILY I.

CIPRINIDÆ.

The Ciprinidæ are recognized by the slightly cleft mouth; the weak jaws, generally edentated, and whose border is formed by the intermaxillaries; by the deeply dentated pharyngeals which compose the trifling armature of the jaws, and by the small number of the branchial rays. Their body is scaly, and they have no adipose dorsal, such as we shall find in the Siluri and in the Salmons. Their stomach has no cul-de-sac, neither are there any cæcal appendages to their pylorus. Of all fishes they are the least carnivorous.

CYPRINUS, Lin.

A very numerous and natural genus, easily distinguished by the small mouth, edentated jaws, and the three flat rays of the branchiæ. The tongue is smooth; the palate provided with a thick, soft, and singularly irritable substance commonly termed a "carp's tongue." The pharynx presents a powerful instrument of mastication, consisting of stout teeth attached to the inferior pharyngeals, which are so arranged as to be able to squeeze alimentary matters between them, and of a stony disk set in a wide cavity under a process of the sphenoid. These fishes have but one dorsal, and their body is covered with scales which most commonly are very large; they live in fresh water, and are perhaps the least carnivorous of the whole class, feeding chiefly on seeds, grass, and even ooze. The stomach is continuous with a short intestine which has no cæcum, and their natatory bladder is divided into two by a strangulation.

We divide them into subgenera as follows:

CYPRINUS, CUV.

Carps, properly so called, have a long dorsal, in which, as well as in the anal, the second ray is formed by a spine more or less stout.

Some of them have cirri at the angles of the upper jaw. Such is

Cyp. carpio, L., Bl. 16. (The Common Carp.) Olive-green; yellowish beneath; dorsal and anal spines strong and dentated; cirri, short; pharyngeal teeth flat, with a striated crown. Originally from central Europe, it now inhabits the ponds of France, where it attains a length of four feet. It is easily bred in fish-ponds and is generally esteemed.(1)

Monstrous individuals of this species are sometimes taken with a very gibbous front and short snout.

A race with large scales is bred, in certain individuals of which the skin is naked in spots, or even entirely: it is called the *Reine des Carpes, Carpe à miroir, Carpe à cuir*, &c.,—*Cyprinus rex cyprinorum*, Bl., 17.

In others the cirri are deficient. Such, in Europe, are,

Cyp. carassius, L., Bl., XI. The body elevated; lateral line straight; head small; caudal truncated. Common in the north of Europe.

Cyp. gibelio, Gm., Bl., 12. The body somewhat less elevated; lateral line arcuated below; caudal crescent-shaped. Common in the environs of Paris. The spines of these two species are weak, and it is with difficulty that any dentations are to be perceived in them.

Such also is the species which is so highly valued in France, where it has been excessively multiplied, on account of the splendour and variety of its colours.

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(1) The Cyprini, *Anne-Caroline*, Lacép., V, xviii, 1, *rouge-brun*, Id. Ib., XVI, 1, *mordoré*, Ib., 2, *vert-violet*, Ib., 3, known merely from Chinese paintings, closely approach the Carp. The Chinese, who take much delight in breeding these fishes, obtain many varieties, all very different, the figures of which are seen in their drawings: it would not be safe, however, to consider them as species, upon these documents only.

Cyp. auratus, L., Bl., 93. (The Golden Carp.) Dorsal and anal spines dentated as in the Common Carp. This fish is at first blackish and by degrees assumes that splendid golden red which characterizes it; some, however, are of a silver colour, and others again are marked by various shades of the three colours. Individuals are found without a dorsal, others have a very small one; the caudal of a third is very large and is divided into three or four lobes; the eyes of a fourth are excessively distended; all these accidental changes, which are the result of domestication, may be variously combined.(1)

To this group also belongs the smallest of the European Carps,

Cypr. amarus, Bl., VIII, 3; *La Bouvière*, or *Péteuse*. An inch long; greenish above; of a fine pale yellow beneath; in the spawning season, in April, there is a steel-blue line on each side of the tail; the second dorsal ray forms a tolerably rigid spine.

Barbus, Cuv.

The dorsal and anal short; the second or third ray of the dorsal formed by a stout spine; four cirri, two on the end of the upper jaw and two at its angles.

B. vulgaris; Cyprinus barbus, L., Bl., 18. (The Barbel.) Known by its oblong head; common in clear streams and fish-ponds, where it is sometimes found ten feet in length.

B. caninus, Bonnelli; *B. plebeius*, Val., *B. eques*, Id.(2), neighbouring species from Italy with a weaker spine, but which differ from the Gudgeons in their four cirri.

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(1) Such are the *Cypr. macrophtalmus*, Bl., 410, or the *gros yeux*, Lacép., V, xviii, 2, the *C. quatre lobes*, Lacép., Ib., 3, and the varieties of the Gold-fish, Bl., 93, 94, &c. See *Collection des Dorades de la Chine*, Sauvigny et Martinet. Add: *Cypr., devarid.*, Buch., pl. vi, f. 94;—*C. catla*, Id., pl. xiii, f. 81.

(2) Add the Barbels of the Caspian sea: *Cyp. mursa*, Guldenst., Nov. Comm. Petrop., XVII, pl. xviii, f. 3, 5;—*C. bulatmai*, Pall., and the Barbel of the Nile; *Cyp. binny*, Forsk., 71; Sonnini, pl. xxvii, f. 3, or *Cyp. lepidotus*, Geoff., Eg., Poiss. du Nil., pl. x, f. 2.

N.B. Bruce, after giving the history of the true Binny, applies to it, through a mistake, the figure and description of a *Polynemus*, which he must have taken in the Red Sea; hence the ideal species *Polynemus niloticus*, Shaw.

Barbels are also found in India: such are, *Cypr. calbasu*, Buch., Fishes of the Ganges, pl. 11; f. 33;—*C. cocsu*, Id., pl. iii, f. 77;—*C. Daniconius*, Id. XV, 89;—*C. kunama*, Russ., 204;—*C. morula*, Buch., XVIII, 91;—*C. gonius*, Ib., IV, 82;—*C. Rohita*, Ib., XXXVI, 85, and several others to be described in our Icthyology; they are also found in America.

Gobio, Cuv.

The Gudgeons have a short dorsal and anal, without spines and cirri.

A species dotted with brown,—*Cyp. gobio*, L., Bl., 8, f. 2, which, notwithstanding its smallness, is highly esteemed, is found in abundance in the rivers of France; it seldom exceeds eight inches in length.(1)

Tinca, Cuv.

The Tenches present all the characters of a Gobio; very small scales, the cirri also small.

There is one of these fishes, *Cyp. tinca*, L., Bl., 14, short and thick, of a yellowish brown, found in France, which is only eatable when taken in certain streams, and is sometimes of a fine golden colour,—*Cypr. tinca auratus*, Bl., 25. It prefers stagnant waters.

Cirrhinus, Cuv.

The dorsal larger than that of a Gobio; the cirri on the middle of the upper lip.(2)

Abramis, Cuv.

Neither spines nor cirri; the dorsal short and placed behind the ventrals; a long anal. Two species are found in France.

A. vulgaris; C. brama, L., Bl., 13. (The Common Bream.) The largest species of this subdivision: there are twenty-nine rays in the anal, and all the fins are obscure. It is a good fish and is very abundant.

A. blicca; S. blicca; C. latus, Gm., Bl., 10; *La Bordelière.* Pectorals and ventrals reddish; twenty-four rays in the anal; is not much esteemed, being chiefly used to feed other fishes in ponds.(3)

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(1) Add *Cyp. capoeta*, Guldenst., Nov. Com. Petrop., XVII, pl. xviii, f. 12;—*C. curmuca*, Buch. Trav. to the Mysore, III, pl. xxx;—*C. bendelesis*, Id., Ib., pl., xxxii.

(2) *Cyp. cirrhosus*, Bl., 411;—*C. mrigala*, Buch., pl. vi, f. 79;—*C. nandina*, Id., VIII, 84?

(3) Add three fishes which ascend the tributaries of the Baltic: the *C. ballerus*, Bl., 9, the *C. vimba*, L., Bl., 4, and the *C. Buggenhagii*, Bl., 95; and of foreign species, *C. cotis*, Buch., pl. xxxix, f. 93.

Labeo, Cuv.

A long dorsal, as in the Carp properly so called, but neither spines nor cirri; remarkably thick, fleshy lips, frequently crenated. They are all foreign to Europe.(1)

Catostomus, Lesueur.

The same thick, pendent and fringed, or crenated lips as in Labeo; but the dorsal is short, like that of a Leuciscus, and is opposite to and above the ventrals. From the rivers of North America.(2)

Leuciscus, Klein.

The dorsal and anal short; neither spines nor cirri; nothing particular about the lips. This subdivision is rich in species, but they are not much esteemed. They are known in different parts of France by the various and rather indistinct appellation of *Meunier*, *Chevaune*, *Gardon*, &c.(3)

We distinguish them by the position of the dorsal, a character however which is not always sufficiently well marked. In some it is opposite to the ventrals. Of this group we find in France,

L. dobula; Cyp. dobula, L., Bl., 5; *Le Meunier*. The head broad, and snout round; pectorals and ventrals, red.

L. idus; C. idus; Le Gardon, Bl., 6, and better *Meidinger*, 36. About the same colours; the head narrower, back higher, and snout more convex.

L. rutilus; Cyp. rutilus, L.; *La Rosse*, Bl., 2. Body compressed, silvery; red fins.

L. vulgaris; Cyp. leuciscus; La Vandoise, Bl., 97, f. 1. Body straight; fins pale; snout slightly prominent. The

L. nasus; Cyp. nasus, L.; *Le Nez*, is taken in the Rhine; its snout is more salient and obtuse than that of the Leuciscus.(4)

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(1) *C. niloticus*, Geoff., Poiss. du Nil, pl. ix, f. 2;—*C. fimbriatus*, Bl., 409, to which must be added the *Catostomus cyprinus*, Lesueur.

(2) M. Lesueur describes seventeen species, Journ. Acad. Nat. Sc. of Philad., 1817, vol. I, p. 88 et seq. and figures nine of them; the first, however, *Cat. cyprinus*, must be abstracted, as it is rather a Labeo. Add *Cypr. teres*, Mitch., op. cit., I, vi, 11, and the *Cyprin sucet*, Lacep., V, xv, 2. [These fishes are the *Suckers* of the United States. *Am. Ed.*]

(3) Bloch and his successors have not adhered to the customary application of these French names, which they have distributed almost at random.

(4) Add: *C. grislagine*;—*C. jeses*, and of foreign species, *C. pula*, Cuv., Russ., 207;—*C. tolo*, Cuv., Russ., 208;—*C. loga*, Buch. Pisc. Gang., pl. xxviii, f. 80;—*C.*

In others, the dorsal is placed opposite the interval between the ventrals and the anal. Of this group are found in France,

L. erythrophtalmus; Le Rotengle; Bl., 1. Fins red as in the Rutilus; the body thicker and more elevated.

L. alburnus; Cyp. alburnus, L.; *L'Ablette;* Bl., 8, f. 4. Body narrow, silvery, brilliant; fins pale; front straight; the lower jaw somewhat longer; very abundant throughout Europe. It is one of those fishes from which nacre is obtained for the manufacture of false pearls.

L. bipunctatus; Cyp. bipunctatus, L.; Bl., 8, f. 1. Very similar to the alburnus; two black points on each scale of the lateral line.

L. phoxinus; Cyp. phoxinus, L.; Bl. 8, f. 5. Spotted with blackish; the smallest of the French species.

L orphus; C. orphus; Bl., 95. A fine minium red; from the rivers of Germany and Holland.(1)

There are some again where it is opposite to the commencement of the anal—the CHELÆ of Buchanan; in several of these the body is compressed almost as in certain Clupeæ. Such is

L. cultratus; Cyp. cultratus, L.; Bl., 37. Also remarkable for its lower jaw, which ascends in front of the upper one, for its large falciform pectorals, &c.(2)

Species with cirri are found in this group.(3) We may separate from all other Cyprini, the

GONORHYNCHUS, Gronov.

Where the body and head are elongated, and, together with the operculum and even the branchiostegal membrane, are covered with small scales; the snout projects before a small mouth without teeth and without cirri; there are three rays in the branchiæ, and a small dorsal is inserted above the ventrals.

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mola, Ib., XIX, f. 86;—*C. sophore,* Ib., XXXVIII, f. 92;—*C. ariza,* Id., Trav. in the Mysore, III, xxxi.

The difficulty of recognizing the figures given by authors of species so similar, is increased from the circumstance that many species are found in the rivers of Europe which have never been figured.

(1) Add the *C. aspius,* Bl., and of species foreign to Europe; *Cyp. basbora,* Buch., Pisc., Gang., II, f. 90;—*C. morar,* Ib., XXXI, f. 75, and a vast number from the rivers of all parts of the globe, several of which have already been indicated by M. Mitchil and Buchanan; some others will be described in our Icthyology. M. Buchanan alone found eighty Cyprini in India. We have only cited here the two he has figured.

(2) Add, *Cyp. clupeoïdes,* Bl., 408, 2;—*C. bacaila,* Buch., VIII, 76.

(3) *Cypr. dantica,* Id., XVI, 88.

G. vulgaris; Cyp. gonorhynchus, Gm., Gronov., Zooph., pl. x, f. 24. The only species known is found at the Cape of Good Hope.(1)

COBITIS, Lin.(2)

The head small; body elongated, invested with small scales and covered with mucus; ventrals very far back and above them a single small dorsal; the mouth at the extremity of the snout, but slightly cleft, without teeth, but encircled with lips fitted for sucking, and with cirri; but three rays in the branchiæ, the apertures of which are small; the inferior pharyngeals strongly dentated. There is no cæcum; and the small natatory bladder is enclosed in a bilobate, osseous case which adheres to the third and fourth vertebræ.(3) Three species inhabit the rivers of France.

C. barbatula, L., Bl.; 31, 3. A small fish four or five inches in length, clouded and dotted with brown on a yellowish ground, with six cirri; common in brooks, &c.

C. fossilis, L.; MISGURN, Lac.;(4) Bl., 31, 1. Sometimes a foot long with longitudinal brown and yellow rays, and ten cirri. It lives in the mud of marshes, even long after they have been dried up or covered with ice. In stormy weather it rises to the surface of the water, which its restlessness keeps constantly agitated; when it is cold, it descends more deeply into the mud. It is constantly inhaling atmospheric air, which, according to the interesting observation of M. Ehrman, after having been converted into carbonic acid, is discharged per anum. The flesh is soft and smells of ooze.(5)

C. tænia, L., xii; Bl., 31, 2. Six cirri; the body compressed, orange-coloured, and marked with a series of black spots; distinguished from the two others by a forked and movable spine, formed before the eye by the suborbital. It is the smallest of the three, and is found in rivers, among stones, &c.; it is not much esteemed.(6)

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(1) Badly copied, Schn., 78.

(2) Κωβῖτις, the Greek name of some small, undetermined fish.

(3) See Schneider, Syn. Pisc. Arted., 5 and 337.

(4) I do not separate the Misgurns from the Cobites; there is no difference whatever in their organization, and the number of jaw teeth is not greater in the former than in the latter; I have vainly sought for those described by Bloch.

(5) Add the three species of Cobitis with unarmed cheeks described by Buchanan, Pisc. Gang, p. 357—359.

(6) Add; *Cob. geta*, Buch., XI, 96, and the other seven species with armed cheeks described by that Ichthyologist, op. cit., p. 350—356.

ANABLEPS Bl.,(1)

The fishes of this genus, for a long time and very improperly united with the Cobites, possess very peculiar characters; the cornea and iris of their very prominent eyes, which are placed under a roof formed on each side by the frontal, are divided into two portions by transverse bands, so that the organ of sight has two pupils, and appears to be double, although it has but one crystalline and one vitreous humour, and but one retina,(2) a peculiarity of which there is no other example among vertebrated animals. In the next place we find that the excretory canal of the organs of generation and of the bladder, in the male, is situated in the anterior edge of the anal fin, which is thick, long, and scaly; its extremity is perforated, and that it serves for the purpose of copulation is indubitable. The female is viviparous, and the young are considerably advanced in growth at the moment of their birth.

The body of these fishes is cylindrical and covered with stout scales; there are five rays in the branchiæ; the head is flattened, the snout truncated, and the mouth transversely cleft at its extremity; both jaws are armed with small and crowded teeth; the intermaxillaries have no pedicle, and are suspended under the nasal bones which form the anterior edge of the snout. The greater part of the pectorals is scaly, and there is a small dorsal on the tail, and nearer to its extremity than the anal. The pharyngeals are large, and furnished with very small globular teeth; the natatory bladder is very large, and their intestine ample, but without cæca.

But a single species is known; the *Anableps tetrophtalmus*, Bl., 361, *Cobitis anableps*, L.; it inhabits the rivers of Guiana.

PŒCILIA, Schn.

The two jaws horizontally flattened, protractile, slightly cleft, and furnished with a row of extremely small and slender teeth; top of the head flat; large opercula; five rays in the branchiæ; the body is but little elongated, and the ventrals not far back; the dorsal above the anal. Small viviparous fishes from the rivers of America.(3) The

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(1) From αναβλεπω, to raise the eyes, a name given by Artedi.

(2) See Lacép., Mém. de l'Institut, tom. II, p. 372.

(3) *Pœcilia Schneideri*, Val., or *P. vivipara*, Schn., 86, 2;—*P. multilineata*, Læsueur, Journ. Ac. Nat. Sc. of Philad., 1821, pl. 1;—*P unimacula*, Val., App. Humb., Zool. Obs., II, pl. li, f. 2;—*P. surinamensis*, Id., Ib., f, 1.

Lebras, Cuv.

Resembles a Pœcilia, with the exception of the teeth which are dentated.

A species is found in Sardinia, the *Pœcilia calaritana*, Bonnelli,(1) a very small fish marked on the flanks with little black streaks.

Fundulus, Lacep.

The Funduli are allied in many particulars to the Pœciliæ; but their teeth are small and crowded, and those of the anterior range hooked; tolerably stout conical ones are found in the pharynx; there are are but four rays in the branchiæ.(2) The

Molenesia, Lesueur,

Is distinguished by the position of the anal between the ventrals and under the origin of the dorsal, which is very large. The teeth are similar to those of a Fundulus, and there are only four or five rays in the branchiæ.(3)

Cyprinodon, Lacep.

Slender, small and crowded teeth; six rays in the branchiæ; otherwise similar to the three preceding genera.

Cyp. umbra, Cuv.; Umbra, Cramer. A small species found in the lakes of Austria, particularly in subterraneous streams; it is of a reddish brown, with some brown spots.(4)

FAMILY II.

ESOCES.

We find no adipose fin in this family. The edge of the upper jaw is formed by the intermaxillary, or when it is not completely so formed, the maxillary is edentated and concealed in the thickness of the lips. The fishes which compose it are extremely voracious; their intestine is short and without cæca; they all have a natatory bladder, and many of them ascend rivers. With the exception of the Microstomæ, all those that are known have the dorsal opposite to the anal. Linnæus united them in the genus

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(1) Add *Lebias ellipsoïdea*, Lesueur, op. cit., 1821, pl. ii, f. 1 and 3;—*Leb. rhomboïdalis*, Val. App. Humb. Zool. Obs., II, pl. li, 3;—*Leb. fasciata*, Id. Ib., 4.

(2) *Fund. cænicolus*, Val., or *Cobitis heteroclita*, Lin., or *Pœcilia cænicola*, Schn.; *Mudfish* of Schœpf.;—*Fund. fasciatus*, Val. loc. cit., LIII, 1, or *Pœcilia fasciata*, Schn., or *Esox pisciculus*, Mitch., of which his *Esox zonatus*, or *Hydrargyre swampine*, Lacép., V, 319, is the young, but the fig. V, 3, is another species;—*Fund. brasiliensis*, Val. loc. cit. LII, 2.

(3) *Molinesia latipinna*, Lesueur, Ac. Nat. Sc. Philad. 1821, III, 1.

(4) Add *Cyprinodon flavulus*, Val., loc. cit. LIII, 3, which is the *Esox flavulus*,

Esox, Lin.

Which we divide as follows:

Esox, Cuv.

The Pikes, properly so called, have small intermaxillaries furnished with little pointed teeth in the middle of the upper jaw, of which they form the two-thirds, those on the sides of the jaw being edentated. The vomer, palatines, tongue, pharyngeals and rays of the branchiæ, bristled with teeth resembling those of a card; a series of long pointed teeth on the sides of the lower jaw. The snout is oblong, obtuse, broad, and depressed; but one dorsal opposite the anal; the large and plaited stomach continuous, with an intestine without cæca, which is twice flexed; a large natatory bladder.

E. lucius, L. Bl., 32. (The Common Pike.) Well known as one of the most voracious and destructive of all fishes, but whose flesh is highly esteemed. This species, which inhabits Europe, is found in the fresh waters of North America, where two other species are also to be met with; the flanks of the one, ***Esox reticularis***, Lesueur, Ac. Nat. Sc. Philad., are marked with brownish lines, sometimes resembling net-work; the other, ***Esox Estor***, Id., Ib., I, 413, is sprinkled with round blackish spots.

GALAXIAS, Cuv.

No apparent scales on the body; the mouth slightly cleft; moderate and pointed teeth in the palatines and two jaws; nearly the whole edge of the upper one being formed by the intermaxillary; a few strong, hooked teeth on the tongue. The sides of the head present some pores, and the dorsal is opposite to the anal as in a true Esox; the intestines also resemble those of the latter.(1)

Mitch., pl. iv, 8, or the *Cobitis maialis*, Schn.;—*C. ovinus*, or *Esox ovinus*, Mitch., Ib.;—*C. variegatus*, Lacép., V, xv, 1.

(1) *Esox truttaceus*, Cuv.;—*Esox alepidotus*, Forst.

ALEPOCEPHALUS, Risso.

The same general form, but the head only deprived of scales, the body being covered with broad ones; the mouth is small, and the teeth extremely delicate and crowded; very large eyes, and eight branchial rays.

Al. rostratus, Risso, Ed., II, f. 27 and Mem. Acad. Turin, XXV, pl. x, f. 24. The only species known; it is taken in the depths of the Mediterranean.

MICROSTOMA, Cuv.

A very short snout; the lower jaw projecting beyond the upper one, and furnished, as well as the small intermaxillaries, with very minute teeth; three broad and flat rays in the branchiæ; the eye large, the body elongated, and the lateral line covered with a row of stout scales; a single dorsal a short distance behind the ventrals; intestines like those of a Pike.

But a single species is known, the *Serpe microstome*, Risso, p. 356. It inhabits the Mediterranean.

STOMIAS, Cuv.

The snout extremely short, and the mouth cleft almost to the gills; the opercula reduced to little membranous laminæ, and the maxillaries fixed to the cheek. The intermaxillary, palatine, and mandibulary bones armed with a few long and hooked teeth; similar ones on the tongue. The body is elongated; the ventrals very far back, and the dorsal opposite to the anal on the posterior extremity of the body.

Two species of these singular fishes were discovered by Risso in the Mediterranean; they are black, and ornamented along the belly with several rows of silvery points. One of them, *Esox boa*, Risso, Ed. I, pl. x, f. 34, has no cirri; the other, *Stomias barbatus*, is furnished with a very long and thick one which is attached to the symphysis of the lower jaw.

CHAULIODUS, Schn.

These fishes, as well as can be ascertained from a figure, Catesb., Supp. pl. ix, and Schn. pl. 85, are nearly allied to Stomias in their head and jaws. Two teeth in each jaw cross the opposite one when the mouth is shut. The dorsal corresponds to the interval between the pectorals and ventrals, which are not placed so far back as those of a Stomias; the first ray of this dorsal is extended into a filament.

C. Sloani, Schn., pl. 85; *Esox stomias*, Sh., V, part I, pl. iii, is the only species known, and has never been taken except at

Gibraltar. It is fifteen or eighteen inches in length, and of a deep green colour.(1)

Salanx, Cuv.(2)

A depressed head; opercula folding beneath; four flat rays in the branchiæ; jaws short and pointed, each being provided with a range of hooked teeth, and the upper one almost entirely formed, by the intermaxillaries, which are without pedicles; the lower jaw slightly elongated from the symphysis by a little appendage furnished with teeth; the palate and bottom of the mouth entirely smooth, as there is not even a lingual projection.(3)

Belone, Cuv.

The whole edge of the upper jaw, which as well as the lower one is extended into a long snout, formed by the intermaxillaries,—both furnished with small teeth, no others in the mouth, and those of the pharynx en pavé. The body is elongated and covered with scales, which are not very apparent, one longitudinal carinated range near the lower edge excepted. The bones are very remarkable for their colour, which is a beautiful green.(4) The intestines differ but little from those of a Pike.

B. vulgaris; Esox belone, L.; Bl., 33. (The Gar Fish.) Two feet long; green above, white beneath; found on the coast of France, where its flesh is much esteemed, notwithstanding the colour of the bones. Neighbouring species inhabit all seas. The bite of one of them, which is said to attain a length of eight feet, is considered dangerous.(5)

Scomberesox, Lacep.—Sairis, Rafin.

The structure of the snout similar to that of a Belone; the same port and scales, with the carinated range along the belly; but the last rays of the dorsal and anal are detached, forming spurious fins as in the Mackerel.

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(1) The *Stomias Schneideri*, Risso, Ed. II, f. 37, appears to me to be of another genus, and even of another order.

(2) *Salanx*, the Greek name of an unknown fish.

(3) There is but one species, a new one.

(4) This colour is inherent in the bone, and does not arise either from cooking or the spinal marrow, as was believed by Bloch, ed. Schn., p. 391.

(5) The *Brochet de Bantam*, Ren., part II, fol. 14, No. 65;—the *Belone crocodila*, Lesueur, Ac. Nat. Sc. Philad., I, 129, probably the same as the *Wahla kuddera*, Russ., 175, and as the variety of the Belone, Lacép., VII, pl. v, f. 1.

Add, *Belone caudimacula*, Cuv., *kuddera*, A, Russ., 176;—*Belone cancila*, Ham. Buchan, XXVII, 70;—*B. argalus*, Lesueur, loc. cit., p. 125;—*B. truncata*, Id., p. 126;—*B. caribœa*, Id., 127, which is perhaps the *timucu* of Marcgr., 168, and other species to be described in our Ichthyology.

One of them is taken in the Mediterranean, the *Scombrésoce campérien*, Lac. V, vi, 3; *Esox saurus*, Bl., Schn., pl. 78, 2; *Saïris nians*, Rafin., Nuov., Gen., IX, 1.(1)

HEMIRAMPHUS, Cuv.

The edge of the upper jaw, which as well as that of the lower one is furnished with small teeth, formed by the intermaxillaries; but the upper jaw is very short, and the symphysis of the lower one is extended into a long point or semi-beak without teeth; the port, fins, and viscera of a Belone; scales large and round, and a carinated range of them along the belly.

Several species are found in the seas of hot climates in both hemispheres; their flesh, although oily, is agreeable to the palate.(2)

EXOCETUS, Lin.(3)

These well known, or Flying-Fishes, as they are called, are instantly distinguished among the Abdominales by the excessive size of their pectorals, which are sufficiently large to support them in the air for a few moments. Their head and body are scaly, and a longitudinal range of carinated scales forms a salient line on the lower part of each flank, as in the Hemiramphi, &c.(1) The head is flattened above and on the sides; the dorsal placed above the anal; the eyes large, the intermaxillaries without pedicles and constituting the whole edge of the upper jaw; their two jaws are furnished with small pointed teeth, and their pharyngeals with teeth en pavé. They have ten branchial rays; their natatory bladder is very large, their intestine straight and without cæca; the superior lobe of the caudal is the shortest.

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(1) Add, *Scomberesox equirostris*, Lesueur, Ac. Nat. Sc. Philad., I, 132;—*Sc. scutellatus*, Id. Ib.

(2) Species from India: *Hem. longirostris*, Cuv., or *kuddera*, C, Russ., 178;—*H. brevirostris*, or *kuddera*, B, Russ., 177, Willughb., App. pl. vii, f. 4;—*H. marginatus*, Cuv.. Lacep., V, vii, 2;—*H. Commersonii*, Cuv., Lacep., V, vii, 3, or the *Demi-bec de Baggewaal*, Ren., part II, pl. v, No. 21.

American species, *H. brasiliensis*, Cuv., or *Esox brasiliensis*, Bl., 391;—*H. hepsetus*, or *Esox hepsetus*, Bl., Schn., and others to be described in our Hist. des Poissons. See also the article of M. Lesueur, Acad. Nat. Sc. Philad., I, 134, et seq.

N.B. M. de Lac. unites the Esox hespetus, Lin., to the *Es. marginatus;* but the former is a compound of two fishes—one, the *Piquitinga* of Marcgr., 159, (the *mœnidia* of Brown, Jam., XLV, 3,) is an Anchovy; the other, *Amœn.* Ac. I, p. 321, appears to me to be indeterminable, but it cannot be a *Hemiramphus*.

(3) Eξωκοιτης, sleeping out, the Greek name of a fish, which, according to the ancients, came on shore to rest. It was most probably either a Goby or a Blenny, as imagined by Rondelet and others. It is difficult to conjecture what could have induced Artedi to associate the fishes here in question with these Blennies: Linnæus separated them, but without altering the name of *exocetus*, which does not belong to them.

They do not fly far: rising in the air to avoid their voracious enemies, they soon fall into the sea, their wings merely acting as parachutes. Birds pursue them through the air and Fishes through the water. They are found in all the seas of hot and temperate climates.

E. exilens, Bl., 397. Common in the Mediterranean, and easily recognized by the length of its ventrals, placed posterior to the middle of the body; the fins of the young are marked with black bands.(2)

E. volitans, Bl., 398. Common in the Atlantic Ocean, and has small ventrals placed anterior to the middle of the body.(3)

The American seas produce species with cirri, which are sometimes simple,(4) sometimes double, and even ramous.(5)

Next to the family of the Esoces we place a genus of fishes, which, though differing but little from the former, has longer intestines and two cæca. It will most probably give rise to a particular family. It is the

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(1) We must not, like Bloch, confound this carina with the lateral line, which, though frequently but slightly marked, is in its ordinary place.

(2) Such was the little Carolina specimen described by Linnæus, and, as I believe, the *Exocetus fasciatus*, Lesueur, Ac. Nat. Sc. Philad., II, pl. iv, f. 2; the second *Pirabebe* of Pison, 61, is the volitans.

(3) I see by the drawings of Commerson and by that of White, Bot. Bay, App., p. 266, as well as by the fishes lately received from our travellers, that both these forms are found in the Pacific Ocean.

N.B. The *exiliens* and the *mesogaster*, Bl., 399, closely resemble each other, and it is not an easy matter to distinguish them by the descriptions and figures of travellers. The *evolans* of Lin. seems to have been a volitans whose scales had fallen.

(4) *Exocetus comatus*, Mitch., op. cit. I, pl. v, f. 1, probably the same as the *Ex. appendiculatus*, W. Wood, Ac. Nat. Sc. Phil., IV, xvii, 2.

(5) *Exocetus furcatus*, Mitch., op. cit. I, f. 2, which I suspect is the same as *Ex. Nuttalii*, Lesueur, Ac. Nat. Sc. Phil., II, iv, 1.

MORMYRUS, Lin.(1)

A compressed, oblong, scaly body; the tail thin at base, swelling out near the fin; the head covered by a naked, thick skin, which envelopes the opercula and branchial rays, leaving no opening in the latter but a vertical fissure, a circumstance which has led some naturalists to assert that these fishes have no opercula, although they are as perfect as in any other, and which has caused the number of their branchial rays to be reduced to one, although they have five or six. The opening of the mouth is small, and almost like that of the mammiferous animal termed the Ant-Eater; its angles are formed by the maxillaries. Slender teeth, emarginated at the ends, are planted in the intermaxillaries and lower jaw, and there is a long band of small crowded teeth on the under surface of the vomer and on the tongue. The stomach is a rounded sac, followed by two cæca, and a long slender intestine almost always enveloped with fat. The bladder is long, ample, and simple. The Mormyri are ranked among the best fishes of the Nile.

One portion of them has a cylindrical muzzle and a long dorsal.(2)

A second has a cylindrical muzzle and a short dorsal.(3)

It is very probable, as observed by M. Geoffroy, that it is in one of these two subdivisions that the *Oxyrynchus* of the Egyptians is to be found.

In a third the snout is short and rounded, and the dorsal short.(4)

In a fourth the forehead forms a gibbous projection in front of the mouth.(5)

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(1) Μορμυρος, the Greek name of a littoral fish variously coloured, probably the *Sparus mormyrus*, L. It was applied by Linnæus, not very happily, to fresh-water fishes of a uniform hue.

(2) The *Morm. d'Hasselquist*, Geoff. Poiss. du Nil., pl. vi, f. 2;—*M. caschive*, Hasselq., 398, which appears to me to differ from the preceding in several important characters, judging from the description;—the *M. oxyrinque*, Geoff. pl. vi, f. 1, which is the *Centriscus niloticus*, Schn., pl. 30;—*M. commune*, Forsk., 74, which does not agree with any of the preceding by the description.

(3) The *Morm. de Denderah* or *anguilloïdes*, L., Geoff. pl. vii, f. 2, confounded with the *Caschive* of Hasselq., by Linnæus, but which is the *Hersé*, Sonnini, Voy. en Eg., pl., xxii, f. 1.

(4) The *Morm. de Salheyhe*, *M. labiatus*, Geoff., pl. xxii, f. 1;—the *M. de Belbeys*, *M. dorsalis*, Id., pl. viii, f. 1, which is the *Kaschoué*, Sonnerat, pl. xxi, f. 3.

(5) The *Morm. bané* or *M. cyprinoïdes*, L., Geoff., pl. viii, f. 2. N.B. The Nile produces several other unpublished species.

FAMILY III.

SILURIDÆ.

This family is distinguished from all others of the order by the want of true scales, having merely a naked skin, or large osseous plates. The intermaxillaries, suspended under the ethmoid, form the edge of the upper jaw, and the maxillaries are reduced to simple vestiges, or are extended into cirri. The intestinal canal is ample, flexed, and without cæca; the bladder large and adhering to a peculiar bony apparatus; the first ray of the dorsal and pectoral is, almost always, a strong articulated spine, and there is frequently an adipose one behind, as in the Salmon.

SILURUS, Lin.(1)

A numerous genus, easily recognized by its nudity, the mouth cleft in the extremity of the snout, and in the greater number of the subgenera, by the strong spine which forms the first ray of the pectoral. It is so articulated with the bone of the shoulder that the fish can either depress it, or raise it perpendicularly, when it is immovable, constituting a dangerous weapon, wounds from which are considered as poisoned; an idea arising from the fact that tetanus frequently ensues.

The head is depressed, the intermaxillaries suspended under the ethmoid and non-protractile, the maxillaries very short, but each of them almost always continued into a fleshy cirrus, to which are added others attached to the lower jaw or even to the nostrils. There is no suboperculum to the gill-cover; the two superior lobes of the stout and cordiform natatory bladder adhere to a peculiar bony apparatus, which is connected with the first vertebræ. The stomach is a fleshy cul-de-sac, the intestine long, ample, and without cæca.(2)

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(1) *Silurus* and *Glanis*, two ancient names, at one time employed as synonymes, and at another as the reverse, given to certain fishes of the Nile, Danube, and Orontes, and of some rivers of Asia Minor. It is almost certain that they belong to this genus.

(2) Hasselquist attributes cæca to the *Schilbé*; I have ascertained, however, that the contrary is the fact.

These fishes abound in the rivers of hot climates. Seeds are found in the stomach of various species. In the true Silurus, or the

Silurus, Lacep.

There is only a small fin with very few rays on the fore-part of the back, but the anal is very long, closely approaching that of the tail. In Silurus, more especially so termed, or the

Silurus, Arted. and Gronov.

There is no evident spine in the small dorsal; the teeth in both jaws are like those of a card, and behind the intermaxillary band of the same, is another on the vomer. Such is the

S. glanis, L.; the *Saluth* of the Swiss; *Wels* or *Scheid* of the Germans, &c.; Bl., 34. The largest fresh water fish found in Europe, and the only one of this extensive genus that it possesses; it is smooth, black, greenish, spotted with black above, with yellowish white beneath; head large, with six cirri; it sometimes exceeds six feet in length, and weighs three hundred pounds. It inhabits the rivers of Germany and Hungary, the lake of Haarlem, &c., and conceals itself in the mud to watch for prey. The flesh, which is fat, is employed in some places for the same purposes as lard.(1) The

Schilbe, Cuv.,

Differs from these true Siluri in a vertically compressed body and in a strong and dentated spine in the dorsal. The small, depressed head, suddenly raised nape, and eyes placed very low, give these fishes a singular appearance.

The species hitherto known inhabit the Nile, where their flesh is less disagreeable than that of the other Siluri, which are found in the same stream. They have eight cirri.(2)

Certain American species with a round, blunt, small head, provided with cirri and almost imperceptible eyes, may constitute a new subgenus.(3) The

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(1) Add, *Sil. fossilis*, Bl., 370, 2;—*Sil. bimaculatus*, Id., 364;—*Wallagoo*, Russel, 160;—*Sil. attu*, Schn., 75;—the *Sil. chinois*, Lacep., V, ii, 1;—*Sil. asotus*, L., Pall., Nov. Act. Petrop., I, xi, 2.

N.B. Judging from inspection of the dried specimen, the *Ompok siluroïde*, Lacep. V, i, 2, is a Silurus whose folded dorsal escaped the notice of the artist who drew it.

(2) *Sil. mystus*, Hasselq., Geoff., Poiss. d'Eg., pl. ii, f. 3 and 4;—*Silurus auritus*, Geoff., Ib., f. 1 and 2.

(3) *Sil. candira*, Spix, X, 1;—*Sil. cæcutiens*, Id., Ib., 2.

Mystus, Arted.; and Lin., Ed. I.

Or that of the *Machoirans*,(1) comprehends Siluri, which, in addition to their first radiated dorsal, have a second that is adipose; they are chiefly the *Pimelodes* and the *Doras* of Lacepede.

Pimelodus, Lacep.

The body merely covered with a naked skin; no lateral armature. This subgenus is still much too numerous, and its species differ so widely in conformation, that we have been compelled to divide and subdivide it. We first distinguish the

Bagrus, Cuv.

A band of small crowded teeth in each jaw and behind that of the upper one, a similar band on the vomer; they may be subdivided by the number of cirri and the form of the head.

Among those which have eight cirri, some have an oblong and depressed head;(2) while in others it is broad and short.(3)

Of such as have six cirri, the most remarkable are those with a snout as depressed and broad as that of a Pike, and more so.(4)

Some have an oval head, whose shagreen-like bones furnish it with a kind of helmet.(5)

The head of others is round, without the helmet, and merely covered with a naked skin.(6)

Some are remarkable for a depressed head, eyes placed very low on its sides, and for an extremely small adipose fin; these greatly resemble a Schilbe.(7)

Finally, there are others again which have but four cirri.(8)

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(1) *Machoiran*, a name given to these fishes in the French colonies. Schneider, p. 478, improperly applies it to Balistes.

(2) *Sil. Bayard.*, Forsk., *Porcus Bayard.*, Geoff., Eg., Poiss., pl. xv, f. 1 and 2;—*Sil. Docmac*, Forsk., Geoff., Ib., 3, 4;—*Pimelodus aor.*, Buchan., XX, 68?

(3) *Sil. erythropterus*, Bl., 369, 2;—*Pimel. carasius*, Buchan., XI, 67;—*Pim. gulio*, Id., XXIII, 66;—*Pim. carcio*, Id., I, 72;—*Pim. nangra*, Id., XI, 63.

(4) *Sil. lima*, Bl. Schn.;—*Sil. fasciatus*, Bl. 366, and various new species. This division forms the genus SORUBIM of Spix.

(5) *Pimélode abouréal*, Geoff., Eg., Poiss., pl. xiv, f. 3 and 4;—*Pimel. bilineatus*, *Deddi-Jallah*, Russel, 169.

(6) The species are new.

(7) They constitute the genus HYPOPHTALMUS of Spix, of which he has two species, the *Hyp. edentatus*, IX, and the *Hyp. nuchalis*, XVII.

(8) *Sil. bagre*, Bl. 365;—*Sil. marinus*, Mitch.

PIMELODUS, properly so called.

The band of teeth in the vomer parallel to that in the upper jaw is wanting, but teeth are frequently observed in the palate. The true Pimelodi, as to the number of filaments and form of the head, present a greater variety than the Bagri.

Thus among those which have but a single band of teeth, some have the head helmed, and an osseous plate or distinct buckler between the helmet and spine of the dorsal.(1)

In others, the buckler is united and forms a single piece with the helmet, which thus extends from the snout to the dorsal.(2)

In others again the head is oval, and covered with skin only, through which the bones are not perceptible; of this group some have six cirri,(3) and others eight.(4)

Some, called *Cats*, have a naked but very broad head; one part of these have six cirri,(5) and another eight.(6)

We should also distinguish those with a small flat head, very small dorsals and almost imperceptible teeth.(7)

Then come those Pimelodi, which, besides the band of teeth in the jaw, have plates of them in the palatines; these latter teeth may be either small and crowded, or bent like those of a card, and then the plate on the nape may be either distinct from the helmet,(8) or be united with it.(9) These palatine teeth are sometimes round, or like small paving-stones.(10)

There are some very singular Pimelodi with teeth, like those of a card, forming a movable group under the skin of the cheek.(11)

Others have an elongated snout,(12) or one that is even pointed and nearly edentated.(1) These latter lead to that much more extraordinary group, the

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(1) *Sil. clarias*, Bl. XXXV, i, 2;—*Pimel. maculatus*, Lacep., V, p. 103;—*Sil. hemiliopterus*, Bl., Schn.

(2) New species.

(3) *Sil. 4-maculatus*, Bl., 368, 2;—*Pim. namdia*, Cuv., Marcgr., 149;—*Pim. Sebæ*, Cuv., Seb. III, xxix, 5;—*Pim. pirinamp.*, Spix, 8.

(4) *Pim. octo-cirrhus*, Cuv., Seb. III, xxix, 1.

(5) New species.

(6) *Sil. catus*, Lin., Catesb., II, xxiii.

(7) New species.

(8) *Pim. herzbergii*, Bl., 367;—the *Pim. doigt-de-nègre*, Lacep.

(9) New species.

(10) New species.

(11) *Pim. gemidens*, Cuv., a new species.

(12) The *Karasche* (*Pim. biscutatus*), Geoff., Eg., Poiss., XIV, i, 2;—*Pim. gagata*. Buchan., XXXIX, 65.

Synodontis, Cuv.(2),

Where the snout is narrow and the lower jaw supports a bundle of teeth, much flattened laterally, terminating in hooks and individually suspended by a flexible pedicle, a mode of dentation of which there is no other example known. The rough helmet formed by the cranium is uninterruptedly continuous with an osseous plate which extends from the base of the first spine of the dorsal, a spine which is very strong, as are those of the pectorals. The inferior cirri, and sometimes even the maxillaries, have lateral barbs. These fishes are found in the Nile, and in the Senegal: they are not eaten.(3)

Ageniosus, Lacep.

All the characters of a Pimelodus, except that there are no true cirri.

In some, the maxillary bone is turned up into a kind of dentated horn instead of being continued into a fleshy and flexible cirrus.(4)

In others, it does not project, and remains concealed under the skin; the dorsal and pectoral spines are but slightly apparent.(5)

Doras, Lacep.

Machoirans, that is to say Siluri, with a second dorsal, which is adipose, and whose lateral line is mailed with a range of bony plates, each of which is relieved by a spine or salient carina. The dorsal and pectoral spines are very strong and deeply dentated; the helmet is rough and continues to the dorsal as in Synodontis, and their shoulder bone forms a point behind.

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(1) *Pim. conirostris*, Cuv.

(2) *Synodontis*, the ancient name of an undetermined fish of the Nile.

(3) *Sil. clarias*, Hasselq., very different from the *clarias* of Gronovius and of Bloch; it is the same as the *Sil. schal*, Schn., Sonnini, pl. xxi, f. 2, or as the *Pimelode scheilan*, Geoff., Poiss. d'Eg., pl. xiii, f. 3 and 4;—*Pimelodus synodontes* Geoff., Ib., XII, f. 5;—*Pim. membranaceus*, Id., Ib., f. 1 and 2. N.B. *Schal* is their generic appellation in lower Egypt—*Gurgur* in upper Egypt.

(4) *Silurus militaris*, Bl., 362.

(5) *Sil. inermis*, Bl., 363, Seb. III, xxix, 8;—*Pimel. silondia*, Buchan., VII, 50. N.B. The *Silurus ascita*, L., Ad. Fred. pl. xxx, f. 2, is nothing else than a common Pimelodus quitting the egg, the yelk of which has not yet completely entered the abdomen. Linnæus took this yelk for an ovary, and Bloch has paraphrased his mistake. It was also through an error of the press that Linnæus is made to place four cirri on the upper jaw—his figures exhibit them on the lower one.

Some of them merely have the band of small and crowded teeth in the upper jaw.(1)

In others, the snout is pointed and the teeth are either wanting or are hardly visible; the maxillary cirri are sometimes furnished with lateral setæ.(2)

HETEROBRANCHUS, Geoff.

The head provided with a helmet that is rough, flat, and broader than that of any other Silurus, a circumstance occasioned by two lateral pieces furnished by the frontals and parietals which cover the orbits and temples. The operculum is still smaller in proportion than in the preceding fishes, and what chiefly distinguishes them from all others is the peculiarity observed by M. Geoffroi, that besides the ordinary branchiæ, they have an apparatus ramifying like a tree, adhering to the superior branch of the third and fourth branchial arch, and which appears to constitute a sort of supernumerary gills. Their viscera resemble those of other Siluri, and their branchial membrane has from eight or nine to thirteen or fourteen rays. The spine of their pectoral is strong and dentated, but there is none such in the dorsal; their body is naked and elongated, as well as their dorsal and anal. There is no spine in the dorsal. The caudal is distinct. All the species known have eight cirri and inhabit the Nile, the Senegal, and some rivers in Asia. Their flesh is indifferent or bad.

Some of them, the MACROPTERONOTES, Lacep., or the CLARIAS, Gronov., have but a single radiated dorsal.

One of these, the *Sharmuth*, or *Black-Fish*, *Silurus anguillaris*, Hasselq. and L., is common in Egypt and in Syria, constituting in the latter a considerable article of food.(3)

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(1) *Silurus costatus*, L., Bl., 376, and Gronov., V, 1, 2, which is also the *Cataphractus americanus*, Catesb., Suppl., IX, usually quoted as *Sil. cataphractus*;—*Sil. carinatus*, Lacep., which appears to me the same as Gronov., III, 4 and 5, generally cited also as the *S. cataphractus*, and as the *Klip-bagre*, Marcgr., 174, thus reducing the *S. cataphractus* to nothing.—*Doras granulosus*, Valenc., App. Humb., Zool., Obs., II, 153.

(2) *Dorus niger*, Valenc., loc. cit., or *Corydoras edentulus*, Spix, V;—*Dor. oxyrhynchus*, Val., Ib.

(3) Add *Macropt. magur*, Buchan. XXVI, the same as the *Silurus* called *anguillaris* by Patr. Russel, 168;—*Sil. batrachus*, Bl., 370, 1, which may be the same as the *Macropteronote brun*, Lac., V, ii, 2,—the *hexacircine* has only six cirri, but it rests merely on Chinese drawings.

Others have a radiated dorsal and a second one that is adipose.(1)

PLOTOSUS, Lacep.

A second radiated dorsal, which, as well as the anal, is very long, both of them uniting at the caudal to form a point as in the Eel; lips fleshy and pendent; the mouth armed in front with conical teeth, behind which are globular ones, those of the upper jaw belonging to the vomer; the body and head enveloped by a thick naked skin; nine or ten rays in the branchiæ. The species known are from the East Indies. They have eight cirri, and behind the anus, and the fleshy and conical tubercle common to all the Siluri, is another appendage which is fleshy and ramified, whose functions must be very singular.

Some of them have large and dentated dorsal and pectoral spines.(2)

In others they are almost hidden under the skin.(3)

CALLICHTHYS, Lin.—CATAPHRACTUS, Lacep.(4)

Sides of the body almost entirely mailed in four ranges of scaly plates, and a compartment of these plates on the head; but the end of the snout is naked, as well as the inferior surface of the body; a single ray in the anterior edge of the second dorsal; the pectoral spine strong, but the dorsal feeble or short. The mouth is but slightly cleft, and the teeth are almost insensible; four cirri; eyes small and on the sides of the head. These fishes can crawl about out of water for some time like the Eel.

The pectoral spine of some is simply rough;(5) in others it is dentated as in most of the Siluri.(6) The

MALAPTERURUS, Lacep.

Is distinguished from Silurus, properly so called, by the absence of the radiated fin on the back, there being nothing but a small adipose one on the tail, and by the total deficiency of a spine in the pectorals, whose rays are entirely soft. The head as well as the body is covered with a smooth skin; the teeth are small and crowded, and arranged in a broad crescent both above and below; there are seven rays in the branchiæ, and the jaws and viscera resemble those of a Silurus.

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(1) The *Halé* (*Heterobranchus bidorsalis*), Geoff., Eg., Poiss. du Nil., pl. xvi, f. 2.

(2) *Platystacus anguillaris*, Bl., 373, 1; Renard, I, fol. 3, f. 19.

(3) *Plotosus cæsius*, Buchan., XV, 44.

(4) CALLICHTHYS, L., first editions. N.B. Block, in his genus CATAPHRACTUS, includes Doras and Callichthys.

(5) *Silurus callichthys*, Bl., 377, 1.

(6) A new species.

M. electricus;—*Silurus electricus*, L.; Geoff. Poiss. d'Eg. pl. xii, f. 1; Brouss., Acad. des Sc., 1782; the *Rausch* or *Thunder* of the Arabs. The only species known; it has six cirri, and the head is not so big as the body, which is enlarged forwards. This celebrated fish, like the Torpedo and Gymnotus, has the faculty of communicating an electric shock. The seat of this power seems to be in a particular tissue, situated between the skin and the muscles, and presenting the appearance of a fatty cellular tissue abundantly furnished with nerves. From the Nile and the Senegal.

PLATYSTACUS, Bl.(1)—ASPREDO, L.

These fishes present very singular characters in the flattening of their head and the widening of the anterior portion of their trunk, which chiefly results from that of the bones of the shoulder; in the proportional length of their tail; in their small eyes, placed on the superior surface; in their intermaxillaries under the ethmoid, directed backwards and provided with teeth on the posterior edge only; and finally and principally, in the fact that they are the only bony fishes known which have an entirely fixed and immovable operculum, a circumstance that is owing to the pieces which should compose it, being soldered to the bone of the tympanum and to the preoperculum. The branchial aperture consists in a simple slit in the skin under the external edge of the head; the membrane, which has five rays, adhering everywhere else. The lower jaw is transverse and the snout projected beyond it. The first pectoral ray is more strongly dentated than that of any other Silurus; there is but one dorsal on the anterior part of the back, the first ray of which is not very strong; the anal, on the contrary, is very long, and extends under the whole of the tail, which is long and slender.

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(1) ASPREDO, L., fourth and sixth edit.—Under this name of PLATYSTACUS, Bloch includes *Plotosus* and *Aspredo*. Lacépede leaves the latter with the Siluri, but makes a distinct genus of the former.

N.B. We must separate from the whole of this great genus SILURUS: 1st, the *Sil. cornutus*, Forsk., p. 66, on which the genus *Macroramphose*, Lac., is founded; it is nothing else than *Centriscus scolopax*, L.: 2d, the genus POGONATUS, Commers., and Lac. The first species is nothing more than the *pogonias*, Lac., II, xvi, 2 and III, p. 1[illegible], and consequently of the family of the Sciænæ; the other, *Pogonatus auratus*, evidently belongs to the genus Umbrina: 3d, the genus *Centronodon*, Lac., or *Silurus imberbis*, Houttuyn, Act. Haarl., XX, 2. 338; it cannot possibly be a Silurus, as it has scales, spines on the opercula, the first dorsal spinous, &c. It is probably allied to the Perches, though Bloch, Schn., p. 110, very gratuitously arranges it among the Sphyrænæ.

But few species are known, and they have six or eight cirri; it is somewhat remarkable, that when the latter number prevails, one pair is attached to the base of those on the maxillaries; the four of the lower jaw are disposed in pairs, one behind the other.(1)

Some of them are found with globules, which appear to be their eggs, adhering to the thorax by pedicles.

LORICARIA, Lin.

So called on account of the angular and hard plates in which the head and body are completely mailed. These fishes are otherwise distinguished from the mailed Siluri, such as the Callichthys and the Doras, by their mouth which opens under the snout. This mouth is most analogous to that of a Synodontis; small intermaxillaries suspended under the snout, and transverse disunited mandibularies, support long, slender, and flexible teeth, terminating in a hook; a broad, circular, membranous veil encircles the opening, and the pharyngeals are furnished with numerous teeth, en pavé. The true opercula are immovable, as in Aspredo, but two small, external, movable plates, appear to supply their place. There are four rays in the membrane. Strong spines constitute the first rays of the dorsal, pectorals, and even of the ventrals. They have neither cæca nor natatory bladder. They may be divided into two subgenera.

HYPOSTOMUS, Lacep.

A second small dorsal furnished with a single ray as in Callichthys; the labial veil simply papillate, and provided with a small cirrus on each side; no plates on the belly; the intestines, spirally convoluted, are as slender as thread, and twelve or fifteen times longer than the body. From the rivers of South America.(2)

LORICARIA, Lacep.

A single dorsal, forward; edges of the labial veil furnished with several cirri, and occasionally bristled with villosities; under part

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(1) *Silurus aspredo*, L.; *Platystacus lævis*, Bl., Seb. III, xxix, 9 and 10;—*Platys. cotylephorus*, Bl., 372;—*Silurus hexadactylus*, Lac., V, p. 82.—The *Platystacus verrucosus*, Bl. 373, 3, differs from the others in having a shorter anal and tail.

(2) *Loricaria plecostomus*, L., B., 374;—*Hyp. etentaculum*, Spix, IV.

of the abdomen covered with plates; intestines of a moderate thickness.(1)

FAMILY IV.

SALMONIDES.

The Salmonides, according to Linnæus, form but a single great genus, clearly characterized by a scaly body, with a first dorsal whose rays are all soft, followed by a second one small and adipose, that is, formed of skin filled with fat, and unsupported by rays. It comprises fishes with numerous cæca and a natatory bladder; nearly all of them ascend rivers, and are highly esteemed. They are naturally voracious. The structure and armature of the jaws are singularly various. This great genus,

SALMO, Lin.

Is subdivided as follows.

SALMO, CUV.

The Salmon, properly so called, or rather the Trout, has a great portion of the edge of the upper jaw formed by the maxillaries; a range of pointed teeth in the maxillaries, intermaxillaries, palatines and mandibularies, and a double one on the vomer, tongue, and pharyngeals; so that of all fishes it is the most completely furnished with teeth. In the old male the end of the lower jaw is bent up towards the palate, where a cavity receives it when the mouth is closed. The ventrals are opposite to the middle of the first dorsal, and the adipose to the anal. There are ten branchial rays or thereabout. There is one flexure in the long and narrow stomach, which is followed by very numerous cæca; the natatory bladder extends from one end of the abdomen to the other, and communicates above with the œsophagus. The body is usually spotted, and the flesh good. These fishes ascend rivers to spawn, leaping over cataracts, &c., and are even found in the brooks and small lakes of the highest mountains.

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(1) *Loricaria cataphracta*, L., or *L. cirrhosa*, Bl. Schn., and *setigera*, Lacep., Bl., 375, 1, 2;—*Loricaria rostrata*, Spix, III;—*Rinelepis aspera*, Id., II;—*Acanthicus hystrix*, Id., 1.

S. salar, L.; Bl., 20. (The Salmon.) The largest species of the genus, with red flesh and irregular brown spots, which soon disappear in fresh water; the cartilaginous hook formed by the lower jaw is inconsiderable even in the old male. From all the Arctic seas, whence it enters the rivers in the spring. The value of this fishery in all northern countries is well known.

S. hamatus, Cuv.; Bl., 98. A whitish ground, spotted with red and black; snout of the male narrowed into a point, and the hook of the lower jaw much more strongly marked than in the salar. Its teeth are stronger and its flesh red, but leaner and not so much esteemed. Taken at the mouths of rivers in Europe.

S. Schiefermulleri, Bl., 103. Less than the salar, with longer and more slender teeth; flanks sprinkled with little crescent-shaped spots on a silvery ground; flesh yellow. Numbers of this species are sent to Paris during the summer.

S. hucho, L.; the *Hucho* of the Danube and its tributaries. Bl., 100, and better, Meidinger, 45. Nearly as large as the salar, differing but little from the preceding in its spots, but has a more pointed snout and much stronger teeth.

With respect to the remaining river Trouts, it may be said that they are found in all the clear streams of Europe, and particularly among the mountains, of very different colours and sizes, among which several naturalists have thought they could detect various species, while others affirm that these are mere varieties, resulting from age, nourishment, and especially from the waters in which they sojourn; this supposition, however, is, I think, stretched beyond the bounds of probability.

S. lemanus, Cuv. From the lake of Geneva, and also found in some neighbouring ones; head and back sprinkled with small round and blackish spots on a whitish ground; the flesh white; individuals are sometimes taken, weighing from forty to fifty pounds.

S. trutta, L.; Bl. 21. (The Salmon Trout.) Ocellated spots, or spots shaped like an X, the upper ones sometimes surrounded with a circle of a lighter hue; many of these spots on the opercula and adipose fin; flesh reddish. The finest specimens of this species are taken from rivulets of clear water, which directly empty into the sea, but it is found at all heights.

S. fario, L.; Bl., 22. (The Common Trout.) Smaller; brown spots on the back, red ones on the flanks, surrounded by a lighter coloured circle, but varying infinitely as to the tint of the ground, which is from a white and a golden yellow to a deep brown;

flesh white; common in every brook whose waters are clear and rapid.

S. punctatus, Cuv.; *S. alpinus*, Bl. 104, but not the *alpinus* of Lin.; the *Carpione* of the lakes of Lombardy? Dotted with small black and red points; flesh delicious; it is found all round the Alps.

S. marmoratus, Cuv. Irregular close brown spots and streaks, so intermixed as to resemble a kind of marbling, &c.; from the lakes of Lombardy. Naturalists are more united in separating the

S. salvelinus, L.; Meidinger, 19, under the name of *alpinus; Truite rouge;* the *Charr* of the English. Red spots on the flank; orange abdomen; anal and pectorals red, their first ray thick and white.

S. alpinus, L.; Bl., 99; Meidin., 22, under the name of *salvelinus*. Nearly the same colours; but the first rays of the inferior fins are not distinguished. This species fills the mountain lakes of Lapland, &c., and constitutes an invaluable supply of food to the inhabitants of that country during the summer.

There is another small trout found in European rivers, the *Salmlet* of the English; *Saumoneau* of the Rhine; Penn. Ill. Brit. Zool., pl. lix, 1, which many consider a distinct species. The greenish of the back and the white of the belly form zigzags, in each of which is a red spot; it is a small, but delicious fish.

S. umbla, L.; Bl., 101. Smaller scales and finer teeth than in either of the others; the spots more strongly marked and frequently wanting; flesh fatter and white, resembling that of an Eel. The Umbla of the lake of Geneva is particularly celebrated.(1)

Osmerus, Artedi.

Two ranges of separated teeth in each palatine, but only a few in front on the vomer; the general form is that of a Trout, but there are only eight rays in the branchiæ. The body is immaculate, and the ventrals correspond with the anterior edge of the first dorsal. Taken in the ocean and at the mouths of large rivers.

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(1) Besides these Salmons and Trouts which are found in Europe, several others have been described by American and Russian naturalists, but they have not been sufficiently compared with the former, so that even Pallas expresses doubts with respect to some of his species. We will endeavour to settle their synonymes in our Ichthyology, but the extent of the details requisite for that purpose prevents us from attempting it here; we shall also in that work describe several species from North America, some of which have been pointed out by Mitchill, Lesueur, Rafinesque, Richardson, &c.

O. eperlanus; Sal. eperlanus, L., Bl. 28, 2. (The Smelt.) The only species known; it is small, and ornamented with the most dazzling silvery and light green tints; an excellent fish.

Mallotus, Cuv.

The cleft mouth of the preceding, but very small and crowded teeth, only in the jaws, palate and tongue; eight branchial rays; the body elongated and covered with small scales; the first dorsal and ventrals posterior to the middle; particularly distinguished by large round pectorals, which almost meet beneath.

But a single species is known, *Salmo groenlandicus*, Bl., 381; the *Capelan*, Duhamel, Sect. I, pl. xxvi; *Clupea villosa*, Gmel. A small fish employed as a bait in the Cod fisheries. The flank of the male during the spawning season is marked with a broad band furnished with long, narrow and raised scales, resembling hairs.

Thymallus, Cuv.(1)

Structure of the jaw similar to that of a Trout; the mouth, however, is but slightly cleft, and the teeth are extremely fine; first dorsal long and elevated; it has larger scales, which also serve as a mark of distinction from the Trout, which this fish resembles in habits and delicacy of flesh. The stomach is a very thick sac; seven or eight rays in the branchiæ.

T. vulgaris; *Salmo thymallus*, L., Bl. 24. (The Grayling.) First dorsal as high as the body, and twice as long as it is high, spotted with black and sometimes with red; brownish, longitudinally streaked with blackish; a good fish.(2)

Coregonus, Cuv.

The mouth as in the preceding subgenera, and more feebly armed, as it is frequently edentated; scales still larger; length of the dorsal less than the height of its anterior portion. Several very similar species are found in Europe; one of them, however,

C. oxyrhynchus; Salmo oxyrhynchus, L.; Bl., 25, under the false name of *Lavaret;* the *Houting* of the Belgians, is easily distinguished by a soft prominence at the end of the snout. From the North Sea and the Baltic, where it pursues the Herring. It is also taken in the lake of Haarlem, &c.(1)

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(1) Artedi comprehended both the Hymalli and Coregoni in his genus COREGONUS.

(2) Add, *Coregonus signifer*, Richardson, I, Voy. Capt. Franklin, p. 26;—*Cor. thymalloïdes*, Id.

C. marœnula; Salmo marœnula, Bl., 28, f. 3; *S. albula*, Ascan. pl. xxix. Strongly characterized by the lower jaw, which projects beyond the upper one.(2)

The others have an obtuse snout, as if truncated; it is extremely difficult, however, to assign to them precise characters. Such are

C. marœna; Salmo marœna, Bl., 27. From the lakes of Brandebourg; its snout, although obtuse, extends beyond the mouth.

C. Wartmanni; Salmo Wartmanni, Bl., 105. From the lakes of Bourget, Constance, the Rhine, &c. The snout is truncated even with the front of the mouth, the head is shorter in proportion, and the form longer and more slender.

C. fera, Jurine, Mem. de la Soc. Phys. of Geneva, III, part I, pl. vii. From the lake of Geneva, and some others; it is higher than the Wartmanni, and has larger fins.

C. hyemalis, Jurine, Ib., pl. viii. From the lake of Geneva, where it is found in the winter only; its head is thicker and its fins are larger in proportion than in the fera.

C. palæa, Cuv. from the lake of Neuchâtel; higher than any of the preceding species, particularly at the nape, and deeply coloured.

C. sikus, Cuv.; Ascan., pl. xxx, under the name of *Lavaret*. From the rivers of Norway; the snout is prominent as in the marœna, but the body is narrower and browner.(3)

ARGENTINA, Lin.

The mouth small and jaws without teeth, as in Thymallus, but the mouth is depressed horizontally; the tongue is armed, like that of the Trouts, &c., with strong hooked teeth, and there is a transverse range of small ones before the vomer. There are six rays in the branchiæ, and the intestines differ but slightly from those of the Trout.

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(1) The genus TRIPTERONOTUS, Lacep., is founded on a bad figure of this *Houting* sent to Rondelet (Rondel., 195), to which, by some mistake, three dorsals had been given—that genus must consequently be suppressed. The very improper name of *Albula nobilis* was transferred to it by Schoenefeld, and Linnæus and Artedi confounded it with the Coregonus, an example followed by Bloch. The *Salmo thymallus latus*, Bl., 26, appears to be a variety of it in the spawning season.

(2) Add *Salmo clupeoïdes*, Pall.

(3) Add, *Salmo silus*, Ascan., XXIV;—*Coregonus albus*, Lesueur, Ac. Nat. Sc. Phil., I, p. 35;—*Cor. quadrilateralis*, Richardson, Franklin's Voy., pl. xxv; f. 2;—*Salmo peled*, Pall.

> *A. sphyræna,* L., Cuv.; Mem. du Mus., I, xi. The only species known; its natatory bladder is extremely thick, and singularly loaded with that silvery substance (nacre) which is so remarkable in fish; it is employed for colouring pearls. The stomach is remarkable for its black colour.(1) From the Mediterranean.

Artedi and several of his successors have united all the Salmonides, which have not more than four or five rays in the branchiæ, in the subgenus CHARACINUS; but there is a sufficient difference in their figure, and particularly in their teeth, to warrant a still greater subdivision. They all, however, have the numerous cæca of the preceding Salmons, with the bladder of the Cyprinidæ, which is divided by a strangulation. The lingual teeth of the Trout are always wanting. We subdivide them as follows:

CURIMATA, Cuv.

The whole external form of a Thymallus; small mouth, the first dorsal above the ventrals, &c. Some of them resemble certain Thymalli in their teeth which are only visible with the glass, and merely differ from them in the number of their branchial rays.(2)

Others have a range of teeth in each jaw, which are trenchant, directed obliquely forwards, the anterior ones longest, and, in a word, comparable to those of a Balistes.(3) From the rivers of South America.

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(1) This fish, which is most certainly the *Argentina* of Willughby, 229, and consequently that of Artedi and Linnæus, always has a second adipose dorsal, as was observed by Brunnich, Icth. mass., 79; it should therefore have been placed among the Salmons. The *Argent. machnata,* Forsk., is the *Elops saurus;* this is also, most probably, the case with the *Argent. carolina* of Lin., although Catesby has omitted the dorsal in the fig. cited, Car., II, xxiv. The Argentina of Gronovius is an *Anchovy,* and that of Pennant a *Scopelus,—Serpe* of Risso. The *Argent. glossodonta,* Forsk., is a particular genus, the Butirinus of Commerson.

(2) *Salmo edentulus,* Bl., 380;—*S. unimaculatus,* Bl., 381, 3;—*S. tæniurus,* Valen. App. Humb., Zool. Obs., II, p. 166;—*S. curima,* Cuv., Marcgr., 156;—*Curimate Gilbert,* Quoy et Gaym, Voy. de Freyc. Zool., pl. xlviii, f. 1;—and probably *S. cyprinoïdes,* Gronov., Zooph., No. 378. They are the PACU, Spix, XXXVIII, and XXXIX. His ANODUS, XL and XLI, only differs in the mouth, which is rather more cleft.

(3) *Salmo fasciatus,* Bl., 379;—*S. Fridericii,* Id., 378.

ANOSTOMUS, Cuv.

The form of a Thymallus and an upper and lower range of small teeth; the lower jaw turned up in front of the upper one and gibbous, so that the little mouth resembles a vertical slit on the end of the snout.(1)

GASTEROPELECUS, Bl.—SERPES, Lacep.

The mouth directed upwards as in Anostomus; but the belly is compressed, projecting, and trenchant, owing to its being supported by ribs which terminate in the sternum; ventrals very small and far back; first dorsal over the anal which is long; conical teeth in the upper jaw, trenchant and dentated ones in the other.(2)

PLABUCUS, Cuv.

The small head and slightly cleft mouth of the Curimatæ; a compressed body; the ventral carina trenchant but entire, and a very long anal; the first dorsal opposite to the commencement of the latter.(3) The

SERRASALMUS, Lacep.,

Already distinguished by that naturalist, is known by the compressed, high body, and the trenchant and serrated belly, to which characters must be added that of the triangular trenchant and dentated teeth. The edentated maxillary passes obliquely over the commissure. There is frequently a horizontal spine in front of the dorsal.

The species known are all from the rivers of South America. It is said that they pursue ducks, and even men, while bathing, inflicting severe wounds with their sharp teeth.(4)

TETRAGONOPTERUS, Artedi.

The long anal, and trenchant, dentated teeth of the Serrasalmi, and the edentated maxillary passing obliquely over the commissure;

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(1) *Salmo anostomus*, L., Gronov., VIII, 2.

(2) *Gastropelecus sternicla*, Bl., 97, 3.

(3) *Salmo argentinus*, Bl., 382, 1; Marcgr., 170;—*S. bimaculatus*, Bl., 16;—*S. gibbosus*, Gronov., Mus., I, i, 4;—*S. melanurus*, Bl. 381, 2.

(4) *Salmo rhomboïdes*, Bl., 383;—*Serras. piraya*, Cuv., Mém. Mus, V, pl. xxviii, f. 4;—*Serras. mento*, Id., Ib., f. 3;—*Serras. aureus*, Spix, XXIX;—*S. nigricans*, Id., XXX.

the mouth however is but slightly cleft, and the abdomen is neither carinated nor dentated.(1)

Chalceus, Cuv.

The same mouth, and trenchant, notched teeth as in the preceding subgenus, but the body is oblong and neither carinated nor dentated; very small, round teeth in the maxillary.(2)

Myletes, Cuv.

These fishes are remarkable for their very singular teeth which resemble short triangular prisms, rounded on the ridge, and excavated on top by mastication, so that three salient points are formed there by the three angles. There are two ranges of these teeth in the intermaxillaries of the slightly cleft mouth, and a single one in the lower jaw, with two teeth behind; the palate and tongue, however, are smooth. The totally edentated maxillaries are placed on the commissure.

Some of them have the elevated figure, the falciform vertical fins, forwardly inclined spine, and even the trenchant and notched abdomen of the Serrasalmi, to which, but for their teeth, we should certainly unite them. One of them even has a horizontal spine in front of the dorsal.(3) Very large ones, whose flesh is much esteemed, are found in America.(4)

Others have an elongated form, the first dorsal being opposite to the interval between the ventrals and the anal. The species known are only found in Egypt.(5)

Hydrocyon, Cuv.

End of the snout formed by the intermaxillaries; the maxillaries commencing near the eyes, or before them, and completing the upper jaw. The tongue and vomer always smooth, but both jaws are furnished with conical teeth; a large suborbital, thin and naked like the operculum, covers the cheek.

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(1) *Tetragonopterus argenteus*, Arted., App. Seb. III, pl. xxxiv, f. 3, or *Coregonoïdes amboinensis*, Art., Spec., 44, improperly confounded with the *Salmo bimaculatus*;—*Chalceus fasciatus*, Cuv., Mém. Mus., V, pl. xxvi, f. 2;—*Serrasalmo chalceus*, Spix, XXXIII, 1.

(2) *Chalceus macrolepidotus*, Cuv., Mém. Mus., IV, pl. xxi, f. 1;—*Ch. opalinus*, Id., Ib., V, pl. xxvi, f. 1;—*Ch. angulatus*, Spix, XXXIV.

(3) *Myletes rhomboïdalis*, Cuv., Mem. du Mus., IV, pl. xxii, f. 3.

(4) Add to the preceding species, *Myl. duriventris*, Ib. f. 2;—*M. brachypomus*, Ib., f. 1;—*M. macropomus*, Ib., pl. xxi, f. 3;—*M. paco*, Humb., Zool. Obs., II, pl. xlvii, f. 2.

(5) The *Raii of the Nile*, which is the *Cyprinus dentex*, L., Mus. Ad. Fred. and ed. XII, or the *Salmo dentex*, Hasselq., and the *S. niloticus*, Forsk., and which is thus twice found in Gmelin and his successors. It is the *Myl. Hasselquistii*, Cuv. Mém. Mus., IV, pl. xxi, f. 2.

Some of them have a compact range of small teeth in the maxillaries and palatines, their first dorsal corresponding to the interval between the ventrals and anal.(1) They inhabit rivers in the torrid zone; their flesh resembles that of the Carp.(2)

Others have a double row of teeth in their intermaxillaries and lower jaw, and a single one in the maxillaries; but their palatines are edentated. Their first dorsal is above the ventrals.(3)

Others again only have a single range in the maxillaries and lower jaw, the teeth being alternately very small and very long, the two second ones below in particular, which, when the mouth is closed, pass through two holes in the upper jaw. Their lateral line is furnished with larger scales, and the first dorsal corresponds to the interval between the ventrals and anal.(4)

There is a fourth sort in which the snout is pointed and very salient; the maxillaries very short, and furnished, together with the lower jaw and the intermaxillaries, with a single compact range of very small teeth; their first dorsal corresponds to the interval between the ventrals and anal. The entire body is covered with strong scales.(5)

Finally, the only teeth possessed by others are those in the lower jaw and intermaxillaries; they are but few, strong, and pointed. Their first dorsal is above the ventrals. But a single species is known, and it inhabits the Nile.(6)

Citharinus, Cuv.

A depressed mouth, transversely cleft in the end of the snout, whose upper edge is wholly formed by the intermaxillaries, and where the small and dentated maxillaries only occupy the commissure; the tongue and palate are smooth, and the adipose fin is covered with small scales, as is the greater portion of the caudal. They inhabit the Nile.

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(1) It is for this reason that M. de Lacepede placed them among the Osmeri.

(2) *Salmo falcatus*, Bl., 385,—*S. odoe*, Id., 386;—*Hydrocyon falcirostris*, Cuv., Mém. Mus., V, pl. xxvii, f. 1;—*Hyd. hepsetus*, Cuv., or *Hydr. faucille*, Zool. Voy. de Freycin., pl. 48, f. 2.

(3) A new species from Brazil, the *Hydroc. brevidens*, Cuv., Mém. Mus., V, pl. xxvii, f. 1, or *Characinus amazonicus*, Spix, XXXV.

(4) Another Brazilian species, *Hydroc. scomberoïdes*, Cuv., Mém. Mus. V, pl. xxvii, f. 2, or *Cynodon vulpinus*, Spix, XXVI;—*Cynodon gibbus*, Id., XXVII.

(5) Another species from Brazil, the *Hydroc. lucius*, Cuv., Mém. Mus., V, pl. xxvi, f. 3, or *Xiphostoma Cuvieri*, Spix, XLII.

(6) The *Roschal* or *Water-dog* of Forsk, 66, or *Characinus dentex*, Geoff., Poiss., d'Eg., pl. 4, f. 1, and Cuv., Mém. Mus., V, pl. xxviii, f. 1, but which is not, as Forskahl thought, the *Salmo dentex* of Hasselquist—that is the *raii*.

Some of them have very small teeth in the upper jaw only, and an elevated body as in Serrasalmus; the abdomen however is neither trenchant nor indented.(1)

Others have several compact rows of numerous slender teeth, forked at the end, in both jaws; their form is more elongated.(2)

SAURUS, Cuv.

A short snout; the mouth deeply cleft, opening far behind the eyes; edge of the upper jaw wholly formed by the intermaxillaries; sharp pointed teeth along the jaws, palatines, tongue, and pharyngeals, but none on the vomer; eight or nine and frequently twelve or fifteen rays in the branchiæ. The first dorsal is a little behind the ventrals, which are large; scales on the body, cheeks, and opercula; viscera similar to those of a Trout. They are salt water fishes, and extremely voracious.

> One of them, *S. saurus*, L., Salv., 242, is found in the Mediterranean.(3) The lake of Mexico produces a second, *S. mexicanus*, Cuv., which is nearly transparent. A third equally diaphanous, with very long flexible teeth, some of which have a sagittiform termination, an extremely short snout and very

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(1) The *Serrasalme citharine*, or *Night-Star* of the Arabs, Geoff., Poiss. d'Eg., pl. v, f. 2 and 3, (*Citharinus Geoffræi*, Cuv.);—*Salmo cyprinoïdes*, Gronov., Mus., p. 378.

(2) The *Characin nefasch*, Geoff., Ib., f. 1, or *Salmo ægyptius*, Gm.; it is the *Salmo niloticus* of Hasselquist, very different from that of Forskahl, which is the *raii*.

(3) Add; *S. saurus*, Bl., 384, which appears to me to differ from the Mediterranean species;—*Salmo fœtens*, Bl., 384, 2;—*S. tumbil.*, Bl. 400;—the *Osmère galonné*, Lac., V, vi, 1;—the *Salmone varié*, Id., V, iii. 3;—the *Osmère à bandes*, Risso, Ed. I, p. 326;—*S. badi*, Cuv., (*Badi motta*) Russel, 172;—*Salmo myops*, Forster, Bl. Schn. p. 421;—*S. minutus*, Lesueur, Ac. Nat. Sc. Philad., V, part I, pl. v;—*S. conirostris*, Spix, XLIII;—*S. intermedius*, Id., XLIV;—*S. truncatus*, Id., XLV, and several new species to be described in our Icthyology. N.B. The *Esox synodus*, Gronov., Zooph., VII, 1, *Synodus synodus*, Schn., *Synode fascé*, Lac., appears to be nothing more than a *Saurus* which had lost its adipose fin: its extreme smallness renders it easily effaced by friction or desiccation.

weak fins,—*S. ophiodon*, Cuv.; *Vana motta*, Russel, 171, is employed in India, when dried and salted, as a condiment.(1)

Scopelus, Cuv.—Serpes, Risso.(2)

Mouth and branchiæ deeply cleft; both jaws furnished with very small teeth; edge of the upper jaw wholly formed by the intermaxillaries; tongue and palate smooth. The snout is very short and obtuse; there are nine or ten rays in the branchiæ, and besides the ordinary dorsal, which is opposite to the interval between the ventrals and anal, there is a very small one behind, in which vestiges of rays are perceptible.

These fishes are taken in the Mediterranean along with Anchovies, where they are called *Mélettes*. One of them, *Serpe Humbolt*, Risso, pl. x, f. 38, is remarkable for the lustre of the silvery points arranged along the tail and abdomen.(3)

Aulopus, Cuv.(4)

The characters of a Salmon and Gadus united; the mouth well cleft; the intermaxillaries, which form the whole of its upper edge, the palatines, the anterior extremity of the vomer and the lower jaw, furnished with a narrow band of teeth resembling those of a card; the tongue and level part of the ossa palati rough. The maxillaries are large and edentated, as is the case with the greater number of the class. The ventrals are almost under the pectorals, their external rays being stout and only forked; the first dorsal opposite to the anterior half of the interval which separates it from the anal; twelve rays in the branchiæ; body, cheeks and opercula covered with large ciliated scales.

One species, *Salmo filamentosus*, Bl., Berl. Schr., X, ix, 2, is found in the Mediterranean.

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(1) The *Salmo microps*, Lesueur, Ac. Nat. Sc. Philad., V, part I, pl. iii, if not the same species, is at least a closely allied one. It forms the genus Harpodon of that naturalist, who considers it as having teeth in the vomer, but they are in the pharyngeals, and not in the vomer: the mistake has arisen from the extreme shortness of the snout.

(2) Σκόπελος, the Greek name of an unknown fish.

(3) I believe this fish to be the same as the pretended *Argentina sphyræna* of Pennant, Brit. Zool., No. 156: thus it would also be found in our Ocean.—Add the *Serpe crocodile*, Risso, p. 357;—the *Serpe balbo*, Id., Ac. of Sc. Turin, Vol. XXV, pl. x, f. 3.—But the *Serpe microstome*, p. 356, certainly belongs to another genus, and to the family of the Pikes.

(4) Αὐλωπὸς, the Greek name of some unknown fish.

STERNOPTYX, Herman.

A genus of small fishes with a very elevated and compressed body, supported by the ribs; their mouth is directed upwards; their humerals form a trenchant crest in front, terminated below by a small spine, and the bones of the pelvis form another, also terminated by a small spine in front of the ventrals, which are so small as to have escaped the notice of the first observer. There is a series of small fossulæ along each side of the pelvic crest which has been considered as a festooned duplicature of the sternum, whence the name of Sternoptyx. Before their first dorsal is an osseous or membranous crest which belongs to the anterior interspinals, and behind that fin a slight membranous projection is visible, which represents the adipose fin of the Salmon; the sides of the mouth are formed by the maxillaries. Two species are found in the Atlantic, which may one day constitute the types of two separate genera.

S. diaphana, Herman, Naturforscher, Fasc. XVI, pl. 8; copied Walbaum, Arted. renov. tom. III, pl. 1, f. 2. Teeth small and crowded; five rays in the branchiæ; its form is singularly oblique, the mouth being out of a vertical line.

S. Olfersii, Cuv. Teeth hooked, and nine rays in the branchiæ. Both these species are taken in the warm parts of the Atlantic Ocean.(1)

FAMILY V.

CLUPEÆ.

This family is easily recognized; there is no adipose fin; the upper jaw is formed, as in the Trouts, by intermaxillaries without pedicles in the middle, and by the maxillaries on the sides; the body is always covered with numerous scales, and in the greater number we find a natatory bladder and many cæca. A part only of the family ascend rivers. The

CLUPEA, Lin.

Has two well marked characters in the narrow and short intermaxillaries, that constitute but a small portion of the upper jaw, the sides of which are completed by the maxillaries, so that these sides are alone protractile; and in the inferior edge of the body, which is compressed, and where the scales form notches resembling those of a saw. The maxillaries, besides, are divided into three parts. The branchiæ are so much cleft, that all the fishes of the genus are said to die instantly when taken from the water. The sides of the branchial rays next to the mouth are pectiniform. The stomach is an elongated sac; the natatory bladder long and pointed, and the cæca numerous. Of all fishes, these have the finest and most numerous bones.

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(1) Our descriptions are drawn from nature. Herman refused to allow his specimen branchial rays and ventrals, although it possesses both; it is still in existence at Strasbourg. We shall be more particular on this subject in our Icthyology.

CLUPEA, Cuv.

The maxillaries arcuated before, and longitudinally divisible in several pieces; opening of the mouth moderate; upper lip entire or not emarginated.

C. harengus, L. Bl., 29, 1. (The Common Herring.) Teeth visible in both jaws; carina of the abdomen but slightly marked; suboperculum rounded; veins on the suborbital, preoperculum and upper part of the operculum. The ventrals arise from under the middle of the dorsal; the length of the head is one-fifth of that of the whole fish, and by transferring backwards the measure of the distance from the snout to the first dorsal, it marks the middle of the caudal. There are sixteen rays in the anal.

This celebrated fish leaves the Arctic seas every summer and descends in autumn on the western coast of France in numberless legions, or rather in solid shoals of incalculable extent, spawning on their way, and arriving at the mouth of the British channel in the middle of winter, in a very extenuated condition. Whole fleets are occupied in this fishery, the extent and importance of which are too well known to need a comment. The best are those taken in the North; such as are caught on the coast of Lower Normandy are lean, dry, and of a disagreeable flavour.

C. sprattus, Bl. 29, 2. (The Sprat.) The proportions of the Herring, but a much smaller fish; no veins on the opercula; a gilt band along the flanks in the spawning season.(1)

C. latulus, Cuv. Schonefeldt, p. 41. (The White-Bait.) The body more compressed and the abdomen more trenchant than in the Herring; height of the body and length of the head, each one fourth of the whole length of the fish; the dorsal more forwards, the anal longer and approaching nearer to the caudal. A very small fish, of the most brilliant silver colour, with a little black spot on the end of the snout.(1)

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(1) Artedi and his successors have confounded the Sprat with the Sardine.

C. pilchardus, Bl. 406; and better, Will., pl. 1, f. 1. (The Pilchard.) About the size of the Herring, but with larger scales; the suboperculum square; radiated striæ on the preoperculum and operculum; the head shorter in proportion than that of the Herring and the dorsal more forward, so that the distance from the snout to the dorsal does not reach the caudal. The ventrals arise from under the end of the dorsal; there are eighteen rays in the anal, and on each side of the caudal are extended two scales longer than the rest. It is preferred to the Herring, particularly on the western coast of England.

C. sardina, Cuv.; Duham., Sect. III, pl. xvi, f. 4. (The Sardine.) So similar to the Pilchard, that the only perceptible difference is its inferior size. It is celebrated for the extreme delicacy of its flavour, and the numbers which are taken on the coast of Brittany. It is also captured in the Mediterranean, where the Herring is unknown.(2) The

ALOSA, CUV.

Differs from Clupea, properly so styled, in an emargination of the middle of the upper jaw; all the other characters are those of the Pilchard and Sardine.

A. vulgaris; Clupea alosa, L., Duham., Sect. III, pl. 1, f. 1. (The Shad.) A much larger and thicker fish than the Herring, attaining a length of three feet, and distinguished by the absence of sensible teeth and by an irregular black spot behind the gills. It ascends the rivers in spring, and is then highly esteemed; when taken at sea it is dry and of a disagreeable flavour.

A. finta, Cuv.; *Cl. finta*, Lac.; the *Venth* of Flanders; *Agone* of Lombardy; *Alachia* of Italy, &c. More elongated than the

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(1) Species allied in form to the latulus: the *Cailleu* (*Cl. clupeola*, Cuv.), Duham., Sect. III, pl. xxxi, f. 3;—the *Sardine de la Martinique* (*Cl. humeralis*, Cuv.), Duham., Ib., f. 4;—*Cl. melanura*, Cuv., Lacep., V, xi, 3, under the name of *Clupanodon Jussieu*, but the description of which belongs to fig. xi, 3, called a variety of the *Clupanodon chinois*;—*Cl. coral*, Cuv., &c.

(2) We may also separate from the true Herrings the *Jangarloo*, Russel, 191, or the *Clupea melastoma*, Schn.; and his *Ditchee*, 192, which have the dorsal posterior to the ventrals, and a long anal.

Shad, and has well marked teeth in both jaws; five or six black spots along the flank. It is found as far as the Nile, but is much inferior to the vulgaris.(1)

CHATOESSUS, Cuv.

The Chatoessi are true Clupeæ, whose last dorsal ray is prolonged into a filament. In some the jaws are equal, and the snout is not prominent; the mouth small and edentated.(2)

In others the snout is more prominent than the jaws, their mouth also is small. The superior combs of the first branchia unite with those of the opposite side, forming a singular pennated point under the palate.(3)

Next to the true Clupeæ come some foreign genera, which approach them in the trenchant and indented abdomen.

ODONTOGNATHUS, Lacep.—GNATHOBOLUS, Schn.

A strongly compressed body, with very acute dentations, as far as the anus; the anal long and low; a very small frail dorsal, which is almost always destroyed; six rays in the branchiæ; the maxillary somewhat extended into a point, and armed with two small teeth directed forwards; ventrals have never been perceived on it.(4)

But a single species is known; the *Odontognathe aiguillonné*, Lacep. II, vii, 2, which resembles a small Sardine in form, but is still more compressed. From Cayenne.

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(1) Bloch, pl. 30, under the name of *finta*, gives an Alosa the posterior part of whose abdomen had been deprived of scales. Add: *Cl. vernalis*, Mitch., V, 9;—*Cl. æstivalis*, Id., V, 6;—*Cl. menhaden*, Id. V, 7;—*Cl. matowaka*, Id. V, 8;—*Cl. palasah*, Cuv., Russ., 198;—*Cl. kelée*, Id., 195; *Clupanodon ilisha*, Ham. Buch., XIX, 73;—*Clupan. champole*, H. Buch., XVIII, 74, and his other species, p. 246—251.

The genera, POMOLOBUS, DOROSOMA, NOTEMIGONUS of Rafin., (Ohio fishes) must approach the Alosa more or less; they have no teeth, but we are not sufficiently acquainted with them to assign their definitive situation.

(2) The *Cailleu-tassard* of the Antilles (*Clup. thrissa*, Bl., 404, f. 3.) Duham., Sect. III, pl. xxxi, f. 3;—*Peddakome*, Russ., 197;—*Megalops oglina*, Lesueur, Ac. Nat. Sc. Phil., I, 359;—*M. notatus*, Id., 36;—*M. cepedianus*, Id., Ib.

(3) *Clupea nasus*, Bl., 427, or *Kome*, Russ., 196.

(4) M. de Lacépède having only seen one badly preserved specimen, thought that its maxillaries naturally projected in front of the mouth like two horns; this, however, was an accidental circumstance, for they are placed in this genus as in all the others. It is from this erroneous idea that arose the name of *Gnathobolus*, i. e. shooting out its jaws.

PRISTIGASTER, Cuv.

Head and teeth of an ordinary Herring; four branchial rays, and apparently no ventrals; the abdomen strongly compressed, forming a trenchant, convex, and dentated arch. From both Oceans.(1)

NOTOPTERUS, Lacep.

The Notopteri, which for a long time were placed among the Gymnoti, approach nearer to the Herrings. Their opercula and cheeks are scaly; their suborbitals, the lower part of their preopercula and interopercula, the two ridges of their lower jaw, and the carina of their abdomen, dentated; both jaws and the palatines armed with fine teeth; most of the upper jaw formed by the maxillary; the tongue furnished with strong hooked teeth. The branchiostegal membrane has a single, but strong and bony ray; two almost imperceptible ventrals are followed by a very long anal, which occupies three-fourths of the length and unites, as in Gymnotus, with the fin of the tail; on the back, opposite to the middle of this anal, is a small dorsal with soft rays.

A species is known which inhabits the fresh water ponds of India; it is the *Gymnotus notopterus*, Pall. Spic., VI, pl. vi, f. 2; the *Clupea synura*, Sch., 426; or the *Notoptère kapirat*, Lacep.(2)

ENGRAULIS, Cuv.

A genus sufficiently distinguished from that of the Herrings by the mouth, which is cleft far behind the eyes, and by the greater opening of the branchiæ, which have twelve or more rays; a little pointed snout, under which are fixed the very small intermaxillaries, projects in front of the mouth; maxillaries straight and elongated.

The common species have not even the trenchant abdomen; their anal is short, and the dorsal corresponds to the ventrals.

E. encrasicholus, *Cl. encrasichol.*, L.; Bl. 302. (The Common Anchovy.) A span long; back, a bluish brown; flanks and belly silvery; is taken in countless numbers in the Mediterranean, and as far as Holland.

E. meletta, Cuv. Duham., Sect. VI, pl. iii, f. 5. A small species with a more convex profile; also from the Mediterranean.

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(1) *Pr. tardoore*, Cuv., Russ, 193;—*Pr. cayanus*, Cuv., a new species.

(2) It is truly the *Sea-Tench* of Bontius, Ind., 78, but not the *Capiral* or *Pungais*, Ren, feuille 16, f. 90, which has long ventrals.

E. edentulus, Cuv.; Sloane, Jam., II, pl. 250, f. 2.(1) A species without teeth. America produces several others equally remarkable.

In a second kind, as in the true Herrings, the body is compressed, and the abdomen trenchant and dentated.(2) The

THRYSSA, Cuv.

Only differs from an Anchovy with a dentated abdomen, in the extreme prolongation of the maxillaries. The only species known are from the East Indies.(3)

MEGALOPS, Lacep.

The jaws of the Megalopes are formed like those of the true Herrings, which they also resemble in their general form, and the disposition of their fins; but their abdomen is not trenchant, nor is their body compressed; their jaws and palatines are furnished with very short, small, and crowded teeth; their branchial rays are much more numerous (from twenty-two to twenty-four) and the last ray of the dorsal, and frequently of the anal, is lengthened into a filament as in the Chatoessus.

America produces a species, the *Savalle* or *Apalike*, *Clupea cyprinoides*, Bl., 403, from Plumier; *Cl. gigantea*, Sh.; *Camaripu guaçu*, Marcgr., which attains the length of twelve feet, and has but fifteen rays in the dorsal; there is a filament also on the anal. There is a second in India, the *Megalope filamenteux*, Lacep., V, xiii, 3, improperly confounded with the first, under the false name of *Apalike*, Russ. 203. It has seventeen dorsal rays.

ELOPS, Lin.

All the characters of a Megalops, but the dorsal filament wanting, and the form somewhat more elongated; twenty rays and upwards in the branchial membrane; the superior and inferior edge of the caudal armed with a flat spine.

Species are found in both hemispheres.(4)

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(1) Add *Engr. lemniscatus*, Cuv., or *piquitinga*, Marcgr., 159, Spix, XXIII;—the *Stolèphore commersonien*, Lacep., V, XII, 1, or *Nattoo*, Russ., 187, probably the *Atherina australis*, White, p. 196, f. 1;—the *Clupée tuberculeuse*, Lacep., V, p. 460. N.B. That his *Cl. raie d'argent* does not differ from his *Stolephore*.

(2) *Clupea atherinoides*, Bl.;—*Cl. telara*, Buch., II, 72;—*Cl. phasa*, Id., p. 240;—*Poorwa*, Russ., 194.

(3) *Clupea setirostris*, Brousson., Dec. Icth., copied Encycl. 316;—*Cl. mystus*, or *Pedda poorawah*, Russ., 190;—*Cl. mystax*, Bl. Schn., 83;—*Poorawah*, Russel, 189.

(4) The *Elops* of the Indian Ocean is the *Argentina machnata* of Forskal, and

Butirinus, Commers.

The jaws formed like those of a Herring; the body round and elongated, as in Elops and Megalops, and the prominent snout of an Anchovy. The mouth is slightly cleft, small crowded teeth in the jaws, and twelve or thirteen branchial rays; particularly distinguished by rounded, closely set teeth on the tongue, vomer, and palatines. From both Oceans.

The Elopes and Butirini are beautiful, silvery fishes, with numerous bones and cæca, that attain a considerable size.(1)

Chirocentrus, Cuv.

The edge of the upper jaw, as in the Herring, formed by the intermaxillaries, and the sides by the maxillaries, which are united with them, both, together with the lower jaw, being furnished with a row of stout conical teeth, the two middle anterior upper ones of which, as well as all those of the lower jaw, are of extraordinary length. The tongue and branchial arches are bristled with teeth resembling those of a card, but there are none on the palate or vomer. There are seven or eight rays in the branchiæ, the external ones very broad. Above and beneath each pectoral is a long, membranous, and pointed scale, and the pectoral rays are very hard; the body is elongated, compressed, and trenchant, but not dentated beneath; the ventrals are extremely small, and the dorsal is shorter than the anal, opposite to which it is placed. The stomach is a long, slender, and pointed sac, the pylorus is near the cardia, and the natatory bladder long and narrow. I find no cæca.

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the *Mugil salmoneus* of Forster, Bl., Schn., p. 121; although he gives it but four branchial rays, I have ascertained this by the figure. It is also the *Jinagow*, Russ., 179, and the *Synode chinois*, Lacep., V, x, 1. The American Elops is the *Mugil appendiculatus* of Bosc, or the *Mugilomore Anne-Caroline*, Lacep., V, 398; the *Pounder*, Sloane, Jam., II, p. 250, f. 1. The *Argentina carolina*, L., is also the same fish, although he quotes but a single bad figure, Catesb., II, xxiv; but the *Saurus maximus*, Sloane, II, pl. 251, 1, usually cited as synonymous with the Elops, is of a totally different genus. It is the *Esox synodus*, L., *Synode fascé*, Lacep., or, what is the same thing, one of our *Sauri* that had lost its adipose fin.

(1) The *But. banana*, Commers., Lacep., V, 45, which is also his *Synode renard*, Id., V, pl. viii, f. 2, or *Esox vulpes*, L., Catesb., II, i, 2, cop. Encycl., 294, is a fish found on the Atlantic Coast of America, the same as the *Ubarana* of Marcgr., Brazil, 154, or *Clupea brasiliensis*, Bl., Schn.; as the *Amia* of Brown; as the *Albula gonorynchus*, Bl., Schn., p. 432, or *Albula Plumieri*, Id. pl. 86; as the *Clupée macrocephale*, Lacep., V, xiv, 1, and as the *Macabi*, Parra, pl. 35, f. 4, or *Amia immaculata*, Bl., Schn., 451. Spix has two of them, pl. xxiii, 2, and xxiv.—The *Butirinus* of India is the *Argentina glossodonta*, Forsk., or *Argentine*

But a single species is known; it is of a silver colour and inhabits the Indian Ocean.(1)

HYODON, Lesueur.

The form of a Herring; abdomen trenchant but not dentated; the dorsal opposite to the anal; eight or nine rays in the branchiæ and hooked teeth in the jaws, vomer, palatines and tongue, as in the Trouts.

The species known inhabit the fresh waters of North America.(2)

ERYTHRINUS, Gronov.

The fishes of this genus, like all the rest of the family, have small intermaxillaries, and a great portion of the sides of the upper jaw formed by the maxillaries; a range of conical teeth occupies the edges of each jaw, among the anterior of which are some larger than the others. Each of the palatines is provided with a plate of small and crowded teeth, and there are but five broad rays in the branchiæ. The head is round, obtuse, furnished with hard bones, and without scales. Indurated suborbitals cover the whole cheek. The body is oblong, slightly compressed, and covered with broad scales like that of the Carp; the dorsal is opposite to the ventrals; the stomach is a wide sac, and there are numerous small cæca. The natatory bladder is very large.

They inhabit the rivers of hot climates, and their flesh is of an agreeable flavour.(3)

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bonuk, Lacep., the *Esox argenteus*, Forst. App. Bl. Schn., 396. Having seen the American species only, I am not yet well acquainted with their distinguishing characters.

(1) The *Esoce chirocentre*, Lacep., V, viii, 1, *sabre* or *sabran* of Commerson, which is the same fish as the *Clupea dentex*, Schn., p. 428, Forsk., p. 72, or as the *Clup. dorab*, Gm., and as the *Wallah*, Russ., 199. It is probably also the *Parring*, or *Chnees*, of the Moluccas, Ren., VIII, 55.

(2) *Hyodon clodalus*, Lesueur, Ac. Nat. Sc. Philad., I, pl. xiv, and p. 367;—*H. tergisus*, Id. Ib., p. 366.

(3) *Esox malabaricus*, Bl., 392;—*Synodus erythrinus*, Bl., Schn. Gron., Mus., VII, vi;—*Syn. tareira*, Bl. Schn., pl. 79, Marcgr., 157;—*Syn. palustris*, Bl. Schn., *maturaque*, Marcgr., 169;—*Erythrinus tæniatus*, Spix, XIX;—probably also the *Esox gymnocephalus*, L.

N.B. The *Synodus vulpes*, only known from Catesby, II, xxx, which appears to me to be the same as the *But. banane*, and as the *Synodus synodus*, Schn. only known by a fig. of Gronovius, Zooph., and Mus., VIII, 2, is a *Salmo saurus*, which had lost its second dorsal. The *Esox synodus*, L., so far as we can judge from the short description, is different.

AMIA, Lin.

The Amiæ are closely related to the Erythrini in their jaws, teeth, and head, which latter is covered with hard and bony plates, in their large scales, and in the flat rays of their branchiæ; but there are twelve of these rays. Between the branches of their lower jaw is a sort of bony buckler, the rudiment of which is visible in Megalops and Elops; behind their conical teeth are others resembling small paving-stones, and their dorsal, which commences between the pectorals and ventrals, extends close to the caudal. The anal, on the contrary, is short. Each nostril is provided with a little tubular appendage. The stomach is ample and fleshy, the intestine wide, strong, and without cæca, and what is very remarkable, the natatory bladder is cellular, like the lung of a reptile.

A. calva, L.; Bl., Schn.; 80.(1) The only species known; it is found in the rivers of Carolina, where it feeds on crabs. It is rarely eaten.

SUDIS, Cuv.(2)

Fresh-water fishes which have all the characters of an Erythrinus, except that their dorsal and anal, placed opposite to each other and of about an equal size, occupy the last third of the total length of the body.

There is one species with a very short snout, *Sudis Adansonii*, Cuv., brought from the Senegal by Adanson, and another, *S. gigas*, Cuv.; *S. pirarucu*, Spix, XVI, of a very great size, with an oblong snout, large bony scales, and singularly rough head, from Brazil. A third, *S. niloticus*, Ehr., discovered by M. Ehrenberg in the Nile, has a singular spiral tube which adheres to the third branchia, perhaps somewhat analogous to that observed in Anabas and other neighbouring genera. The

OSTEOGLOSSUM, Vandelli,

Has many points of resemblance with Sudis, but is particularly distinguished from that genus by two cirri which float from beneath the symphysis of the lower jaw; the anal is united with the caudal; the tongue is bony and excessively asperous from the circumstance of its being so completely covered with short, straight, and truncated teeth, that it serves as a rasp for reducing fruits into pulp, or for expressing their juice.

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(1) N.B. The *Amia immaculata*, Schn., 451, or the *Macabi*, Parra, XXXV, 1, 3, 5, is nothing more than the *Butirin banane*.

(2) *Sudis*, a name employed by Pliny as synonymous with *Sphyræna*.

O. Vandellii, Cuv.; *Ischnosoma bicirrhosum*, Spix, XXV. A tolerably large species from Brazil.

LEPISOSTEUS, Lacep.

The snout formed by the union of the intermaxillaries, maxillaries and palatines with the vomer and ethmoid; the lower jaw equal in length, and the edges of both of them, their whole interior surface being covered with rasp-like teeth, provided with a series of long pointed teeth. The branchiæ are united on the throat by a common membrane which has three rays on each side. The scales are of a stony hardness, and the dorsal and anal opposite to each other and very far back. The two last rays of the tail-fin, and the first of all the others, are invested with scales which give them the appearance of being dentated. The stomach is continuous with a thin intestine which is twice flexed and provided with numerous short cæca at the pylorus; the natatory-bladder is cellular as in the Amiæ, and occupies the whole length of the abdomen.

They inhabit the lakes and rivers of the hot climates of America,(1) attain a large size, and form an agreeable food.(2)

POLYPTERUS, Geoff.

Margin of the upper jaw immovable, the middle formed by the intermaxillaries, and the sides by the maxillaries; a shagreened bony plate, like those on the rest of the head, covers the whole cheek, and there is but a single flat ray in the branchiæ. The elongated body is invested with stony scales as in Lepisosteus, and what particularly distinguishes this genus from all others is a great number of separate fins extending along the back, each of which is upheld by a strong spine, furnished with some soft rays, attached to its posterior edge. The caudal surrounds the end of the tail, the anal is close to it, the ventrals are very far back, and the pectorals placed on a scaly and somewhat elongated arm. There is a range of conical teeth round each jaw, and behind them, others which are small and crowded, or rasp-like. The stomach is very large, the intestine thin, straight, and furnished with a spiral valve and a single cæcum; the double natatory bladder has large lobes, that on the left is particularly so, and communicates with the œsophagus by a wide hole.

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(1) I do not believe with Bloch that the fish from the East Indies, Renard, VIII, f. 56; Valent., III, 459, is the *Esox osseus*—it is more probably a species of Belone.

(2) The Caiman, *Esox osseus*, L., Bl., 390;—the *Lepisostée spatule*, Lacep., V, vi, 2, and the other species or varieties described by Rafin., Fishes of the Ohio, p. 72, et seq.

N.B. Under the name of *Esox viridis*, Linnæus appears to have united a description of the *Belone* sent by Garden with the figure of the Caïman given by Catesby, II, xxx.

There is one species with sixteen dorsals, discovered in the Nile by M. Geoffroy, *Polypterus bichir*, Geoff., Ann. Mus., I, v; and another from the Senegal which has but twelve, the *P. senegalus*, Cuv. They are both eaten.

ORDER III.

MALACOPTERYGII SUBRACHIATI.

This order is characterized by ventrals inserted under the pectorals; the pelvis is also directly suspended to the bones of the shoulder. It contains almost as many families as genera.

FAMILY I,

GADITES,

This family is almost wholly composed of the great genus

Gadus, Lin.(1)

Recognized by the ventrals, which are pointed and attached to the throat. The body is moderately elongated, slightly compressed, and covered with rather small and soft scales; the head is well proportioned, but without scales; all the fins are soft; the jaws and front of the vomer armed with pointed, unequal, moderate or small teeth, dis-

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(1) *Gadus*, the Greek name of a fish also called *Onos*. Artedi applied it to this genus in order to avoid those of *Onos*, *Asellus*, and *Mustela*, employed by the ancients, and which were thought, by the first modern icthyologists, though without proof, to indicate some of our Gadi, but which, being also name sof quadrupeds, would have occasioned ambiguity.

posed in several rows, and resembling a card or rasp; the branchiæ are large and have seven rays. Most of the genus have two or three fins on the back, one or two behind the anus, and a distinct caudal. The stomach forms a strong and large sac, the cæca are numerous, and the intestine is long. The natatory bladder is large, strong, and frequently dentated on the sides.

The greater number of these fishes inhabit cold or temperate seas, and constitute the object of important fisheries. Their white flesh, easily separated in layers, is generally esteemed as light, wholesome and sapid. They may be subdivided as follows:

MORRHUA, CUV.

Three dorsal fins and two anals; a cirrus at the point of the lower jaw.

> ***Gadus morrhua*, L. Bl. 64.(1) (The Cod.) From two to three feet long; back spotted with yellowish and brown; it inhabits the whole Northern Ocean, and multiplies so excessively in north latitudes, that whole fleets are annually despatched to capture it. The fresh Cod is termed in France *Cabeliau*, from its Dutch name.**
>
> ***Gadus æglefinus*, L.; Bl. 62. (The Haddock.) The back brown, belly silvery, and lateral line black; a blackish spot behind the pectoral;** quite as numerous in northern latitudes as the cod, but not so much esteemed.(2)
>
> *Gadus callarias*, L.; Bl. 63;(3) the *Faux Merlan* of the Paris market. (The Dorse.) Spotted like the Cod, but generally much smaller, and the upper jaw longer than the other. The best of the genus when eaten fresh, and in great request on the coast of the Baltic.(4)

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(1) Bélon is of opinion that *morrhue* is derived from *merwel*, a name which he says is English; it is not to be found, however, among the modern authors of that nation—they call it Cod or Cod-fish.

(2) *Egrefin*, or rather *Eaglefin*, according to Belon and Rondelet, was its ancient English name. It is the *Schelfisch* of Anderson, the Germans, Dutch, Danes, &c.

(3) *Dorsch*, the name of this fish on the coast of the Baltic. *Callarias*, *Galarias*, &c. were undetermined ancient names which were certainly not applicable to a fish foreign to the Mediterranean.

(4) Add; the *Tomcod* (*G. tomcodus*, Mitch.);—the *Tacaud*, *Gode*, *Mollet* (*G. barbatus*, Bl. 166);—the *Capelan* (*G. minutus*, Bl. 67, 1);—the *Wachnia*, (*G. macrucephalus*, Tiles.) Act. of Petersb., II, pl. xvi;—*Gadus gracilis*, Id. Ib. pl. xviii;—the *Saida* (*Gad. saida*, Lepechin) Nov. Com., Petrop., XVIII, p. v, f. 1, copied Encyclop., f. 360;—the *Bib* (*Gad. luscus*, Penn.), cop. Ency. 102;—*Gad. blennoïdes*, Penn., copied Encyclop., 363.

MERLANGUS, Cuv.

The same number of fins as the Cod, but no cirri.

Gadus merlangus, L.; Bl. 65. (The Whiting.) Well known along the sea-coast for its abundance and the lightness of its flesh; it is distinguished by its pale reddish-grey back and silvery belly, and by the superior length of the upper jaw; the whole fish is about a foot long.

Gad. carbonarius, L.; Bl. 66; *Le Colin*, &c. (The Coal-fish.) Twice the size of the whiting, and of a deep brown colour; the upper jaw shorter; lateral line straight; the flesh of the adult is coriaceous, but it is salted and dried like the Cod.(1)

Gad. pollachius, L. Bl., 68. (The Pollach.) The jaws and nearly the form of the carbonarius; brown above, silvery beneath; flanks spotted. A better fish than the preceding one, and only inferior to the Dorse and Whiting. They all inhabit the Atlantic, and live in large troops.(2)

MERLUCCIUS, Cuv.

But two dorsal fins and a single anal; the cirri deficient as in Merlangus.

Gad. merluccius, L.; Bl., 164. (The Hake.) From one to two feet in length, and sometimes much longer; the back brown-grey; anterior dorsal pointed; the lower jaw longest. Great numbers are taken in the Ocean and in the Mediterranean, where the inhabitants of Provence call it the *Merlan*; salted and dried, it receives in the north the name of *Stockfisch*, which is also applied to the Cod.(3) The

LOTA, Cuv.

To the two dorsals and one anal, adds a greater or less number of cirri.

Gad: molva, L.; Bl., 69.(4) (The Ling.) From three to four feet in length; olive above, silvery beneath; the two dorsals of an equal height; the lower jaw somewhat shortest and furnished with a single cirrus. This fish, which is almost as abundant as the Cod, is as easily preserved, and constitutes a fishery of nearly as much importance.(1)

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(1) The common French name *Colin* is taken from its northern appellation of *Kohl-fisch*, or Coal-fish.

(2) Add the *Sey*, *Gadus virens*, Ascan., 25.

(3) Add, *Gad. magellanicus*, Forst., App., Bl., Schn., p. 10;—*Gad. maraldi*, Risso, Ed. I, f. 13.

(4) *Længa*, *Længe*, *Ling*, names of this fish in various northern countries. *Molua*, a corruption of *morrhua*, applied to this species by Charleton.

Gad. lota, L.; Bl., 70. (The Burbot.) Length, from one to two feet; yellow, marbled with brown; a single cirrus on the chin; the two fins of equal height; the slightly depressed head and almost cylindrical body give this fish a very peculiar aspect. It is the only one of the genus that ascends rivers to any great distance; its flesh and liver, which latter is very voluminous, are highly esteemed.(2)

Motella, Cuv.

The anterior dorsal is so low in this subgenus that it is scarcely perceptible.

Gad. mustela, L. Bl., 165, under the name of *G. tricirrhatus*. Fawn-coloured brown, with blackish spots; two cirri on the upper jaw, and a third on the lower one.(3)

Brosmius, Cuv.

The dorsal entire, and forming one single long fin that extends close to the tail.

They are only found in the North. The most common species, *G. brosme*, Gm., Penn. Brit. Zool., pl. 34, never descends further than the Orkneys. A larger species, *G. lub.*, New Stockh. Mem., XV, pl. 8, it appears is taken in Iceland.(4)

Brotula, Cuv.

The dorsal and anal united with the caudal forming one fin, terminating in a point.

But a single species is known, the *Enchelyopus barbatus*, Bl. Schn.; Parra, pl. xxxi, f. 2.(5) From the Antilles. The

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(1) Add, *Gad. bacchus*, Forst., App., Bl., Schn., p. 53;—*Lota elongata*, Risso, Ed. II, f. 47.

(2) Add *Gadus maculosus*, Lesueur, Ac. Nat. Sc. Philad., I, p, 83.

(3) Add, *Gad. cimbricus*, Schn., pl. 9; or *G. quinquecirrhatus*, Penn. Brit. Zool. pl. 33, improperly called *Mustela* by Bloch and Gmelin. Compare, also, the *Mustela maculata* and *fusca*, Risso, Ed., II, p. 215 and the *Blennius lupus* and *labrus*, Rafin., Caratt., pl. iii, f. 2 and 3.

(4) The names of *Ling* and *Dorse* are also applied to the Torsks (Bromus) in several Cantons. See Penn., loc. cit., and Olafsen. Voy. en Isl., tr. fr. pl. 27 and 28.

(5) My four subdivisions, Lota, Motella, Brosmius, and Brotula, are united by Schneider in the genus Enchelyopus. This name, originally formed by

PHYCIS, Arted., and Schn.(1)

Only differs from the other Gadi in having ventrals with a single ray, and frequently forked. The head is thick, the chin furnished with a cirrus, and the back with two fins; the second of which is long. Some species are found in the seas of Europe.

P. mediterraneus, Laroche; *P. tinca*, Schn.; *Blennius phycis*, L.; Salvian.; fol. 230. (The Sea-Tench.) The most common in the Mediterranean; its anterior dorsal is round, and not higher than the other; ventrals about the length of the head.

P. blennoides, Schn.; *Gad. albidus*, Gm.; *Blennius gadoides*, Riss.; *Gad. furcatus*, Penn.; *Merlus barbu*, Duham., II, pl. xxv, f. 4. (The Forked Hake.) Another species that is also taken in the Ocean; the first dorsal is elevated, and its first ray considerably elongated; ventrals twice the length of its head.(2)

RANICEPS, Cuv.

The head more depressed than that of a Phycis or of any other Gadus, and the anterior dorsal so extremely small, that it is lost, as it were, in the thickness of the skin. From the Ocean.(3)

MACROURUS, Bl.—LEPIDOLEPRUS, Risso.

It is impossible to avoid approximating the fishes of this genus to the Gadi. Their suborbitals unite in front with each other, and with the bones of the nose, to form a depressed snout which projects above the mouth, and beneath which the latter preserves its mobility. The entire head and body are invested with hard scales covered with small spines; ventrals small and somewhat jugular; pectorals moderate; first dorsal short and high; the second dorsal

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Klein for all sorts of elongated fishes, signifies *anguilliform*. Gronovius restricted it to the *Blennius viviparus*, which is my genus ZOARCUS.

(1) *Phycis*, the old name of a Goby. Rondelet applied it to our first species, of which Artedi had made a genus, united with the Blennies by Linnæus, and re-established by Bloch, Ed. Schn., p. 56.

(2) The above characters were taken down by me with both the fishes under my eye. The *Batrachoïdes Gmelini*, Riss., Ed. I, fig. 16, does not differ from our first species. Add, the *Enchelyopus americanus*, Schn., or *Blennius chubs*, Nat. of Berl., VII, 143, or *Gadus longipes*, Mitch., I, 4. N.B. The fig. of Schn., pl. vi, is improperly referred to the *Phycis tinca*, as has been truly remarked by M. de la Roche, Ann. Mus., XIII, p. 333; it is rather that of the *G. longipes*.

(3) The *Gadus raninus*, Mull. Zool. Dan. pl. 45. *Blennius raninus*, Gmel. *Batrachoïdes blennioïdes*, Lacep. *Phycis ranina*, Bl., Schn., 57;—the *Gadus trifurcatus*, Penn. Brit. Zool., III, pl. 32. *Phycis fusca*, Schn.

and the anal both very long, uniting in a point at the caudal; only very fine and very short teeth in the jaws. They inhabit deep water, and when taken from it utter sounds similar to those produced by a Gristes.

Two species are captured in the depths of the Ocean and the Mediterranean, the *Lepidol. cælorhynchus* and *tranchyrynchus* of Risso, Ed. I, pl. vii, f. 21 and 22.(1)

FAMILY II.

PLANI.

The second family of the Malacopterygii Subrachiati, commonly called *Flat-fishes*, comprises the great genus

PLEURONECTES, Lin.(2)

These fishes present a character, which, with respect to vertebrated animals, is perfectly unique: it is the total want of symmetry in the head, where both eyes are on one side, which always remains uppermost when the animal is swimming; and which is always deeply coloured, while that on which the eyes are wanting is always whitish. The remainder of the body, although, generally speaking, formed as usual, participates a little in this irregularity. Thus the two sides of the mouth are not equal, and the two pectorals are rarely so. Their body is strongly compressed and vertically elevated; the dorsal extends along the whole back; the anal occupies the under part of the body, and almost seems to be continued forwards by the ventrals, which are frequently united with it. There are six rays in the branchiæ. The abdominal cavity is small, but is prolonged by a sinus, which penetrates into the thickness of both sides of the tail, for the purpose of lodging a portion of the viscera. The natatory bladder is wanting, and they seldom quit the bottom. The cranium is rendered an object of curiosity by this subversion, which throws both orbits on one side; all the bones, however, common to other genera, are found in it, but unequally proportioned. They are taken along the coasts of almost all countries, and furnish a wholesome and delicious article of food.

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(1) Direct comparison has satisfied me that the *Lepidoleprus cælorhynchus* of the Mediterranean, Risso, Ed. I, pl. vii, f. 22, does not differ in the least from the *Macrourus rupestris*, Bl., 177, or *Coryphæna rupestris*, Gmel., Gunner, Mem. de Dronth., III, pl. iii, f. 1. On the other hand, the *Lepidoleprus trachyrhynchus*, Risso, Ib., f. 21, is the same fish as the *Oxycephas scabrus*, Rafin., Indic. pl. 1, f. 2. The same species, or one closely allied to it, is given in the Atlas of Krusenst, pl. lx, f. 8 and 9. Giorna had also furnished incomplete figures of the two species, Mem. of the Ac. of Turin, Vol. IX, pl. 1. The *Lepidoleprus trachyrhynchus* is also the *Mysticetus* of Aldrovand. Pisc. p. 342.

(2) *Pleuronectes*, a name formed by Artedi, from πλευρα, the flank and νηκτης, a swimmer, because they swim on the side. The ancients gave them different names according to the species, such as *Passer*, *Rhombus*, *Buglossa*, &c.

Individuals are sometimes captured whose eyes are placed on the side opposite to that in which they are generally seen, they are then said to be *contournés*, or turned; others again have both sides of the body coloured alike, when they are called *doubles* or doubled; it is most generally the brown side which is thus reproduced, though it sometimes happens to the white one.(1) We divide them as follows:

PLATESSA, Cuv.

A range of obtuse trenchant teeth in each jaw, and, generally, teeth en pavés in the pharyngeals; the dorsal extending no farther than to above the upper eye, and leaving, as does the anal, a naked interval between it and the caudal. The form of these fishes is rhomboidal, and most of them have their eyes on the right; they have two or three small cæca. Several species are found in the seas of Europe, such as

P. platessa, L.; Bl., 42. (The Plaice.) Easily recognized by six or seven tubercles, forming a line on the straight side of its head, between the eyes, and by the pale yellow spots which relieve the brown on the same side of the body. Its height is but one third of its length. Its flesh is considered more tender than that of any of this subgenus.(2)

P. latus, Cuv. (The Broad Plaice.) The same tubercles as the vulgaris, but the body is only once and a half as long as it is high. It is sometimes taken on the coast of France, though rarely.

P. flesus, L.; Bl., 44, and 50, under the name of *Pl. passer*.(3)

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(1) The *Rose-coloured Flounder*, Shaw, IV, ii, pl. 43, is one of those in which the white side is doubled.

(2) It would appear that there is a very large Platessa found in the North, which, in some respects, differs from that taken on the coast of France, and chiefly in the spine, which, behind the anus, lies buried under the skin—it is the *Pl. borealis*, Faber, Isis, tom. XXI, p. 868.

(3) The *Pl. passer* of Artedi and Linnæus does not differ from the Turbot; that of Bloch is only an old Flounder turned to the left.

(The Flounder.) Nearly similar in form to the platessa, but with lighter spots; more granules on the salient line of the head; a small rough button on the base of each ray along the whole of the dorsal and anal; lateral line covered with roughened scales. This species ascends rivers to a great distance, and individuals are frequently found *turned.*

P. pola, Cuv.; *Vraie Limandelle,* Duham. Sect. IX, pl. vi, f. 3 and 4. The form oblong and approaching that of the Sole, although wider, and distinguished from other Platessæ with trenchant teeth by a smaller head and mouth; body smooth and lateral line straight. It is considered in France equal to the Sole.

P. limanda, L.; Bl., 46. (The Dab.) Form rhomboidal, like that of the Flounder; eyes large, with a salient line between them; the lateral line strongly curved above the pectoral; scales rough, whence its French name *Limande* (from *lima,* file); the teeth on a single range as in other Platessæ, but narrower and almost linear; the sides on which the eyes are placed of a light brown, with some faded brown and whitish spots.(1)

HIPPOGLOSSUS, Cuv.

The shape and fins of a Platessa, with the jaws and pharynx armed with teeth, which are most commonly strong and pointed; the form is usually more oblong.

Pl. hippoglossus, L.; Bl., 47. (The Holibut.) Eyes on the right side; lateral line arcuated above the pectoral. From the north seas, where it attains a length of six or seven feet, and weighs from three to four hundred pounds. It is salted, dried and sold by pieces throughout the North.(2)

The Mediterranean produces several smaller species, some of which have the eyes on the left; one of them is the

Pl. macrolepidotus, Bl., 190; *Citharus,* Rondel., 314. Oblong; lateral line straight; distinguished by the scales, which are larger in proportion than in any other.

RHOMBUS, Cuv.

Teeth small and crowded, or like those of a card in the jaws and pharynx, as in Hippoglossus; but the dorsal advances towards the edge of the upper jaw and extends, as well as the anal, close to the caudal. The eyes of most of them are sinister.

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(1) Add, *Pleur. planus,* Mitch.:—*Pleur. stellatus,* Pall., Mem. Ac. Petersb., III, x, 1.

(2) The *Pl. limanoïdes,* Bl., 188, or *Citharus asper,* Rondel, 315, and the *pinguis,* Faber, Isis, tom. XXI, p. 870, also appear to be northern Hippoglossi. Add *Pleur. erumei,* Bl. Schn., or *Adalah,* Russel, I, 69;—*Pl. nalaka,* Cuv., or *Norèe nalaka,* Russel, 77.

In some the eyes are approximated, the interval being occupied by a slightly salient crest. Such are the two following large species of the coast of Europe, the most highly esteemed of the whole genus.

Pl. maximus, L.; Bl., 49. (The Turbot.) The body rhomboidal and almost as high as it is long, the brown side studded with small tubercles.

Pl. rhombus, L.; Bl., 43; *la Barbue;* the body more oval and without tubercles; distinguished by the first rays of the dorsal, which are half free, and split into thongs at the extremity.

Pl. punctatus, Bl. 189; *Pl. lævis*, Shaw; *Pl. hirtus*, Dan. Zool., pl., 103; the *Kitt*, Penn., pl. 41; Ray, Syn., pl. 1, f. 1; Duham., Sect. IX, pl. v, f. 4. Much less common on the coast of Europe; oval like the vulgaris, but has no thongs to its rays; scales rough; teeth very small; the cheek covered as if with fine velvet; black spots and points on a brown ground.(1)

Pl. cardina, Cuv.; Duham., Sect. IX, pl. vi, f. 5; and Ray, 170, pl. 1, No. 2.(2) (The Whiff.) A perfect oblong; its first rays free but simple; teeth very short, small and crowded; white and blackish spots, partly laid on a brown ground. It is sometimes, though rarely, taken on the coast of the British Channel.

Pl. nudus, Risso; *Arnoglossum*, Rondel., 324. A Mediterranean species but a few inches long, whose large thin scales are easily dislodged. The same sea produces another, the

R. candidissimus, Risso, Ed. II, f. 34; *Pl. diaphanus*, Schn., IV, part ii, 309. Still smaller, wholly diaphanous, with a series of separated red spots on the dorsal and anal.

In others the eyes are far apart and the upper one is thrown backwards, the interval between them being concave. At the base of the maxillary, on the side on which the eyes are placed, is a small salient hook, and sometimes a second one is found over the lower eye. Species of this description are taken in the Mediterranean.(1)

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(1) I have reason to believe that the *Pl. unimaculatus*, Risso, Ed. II, f. 35, is merely a sexual variety of the punctatus.

(2) These figures represent the eyes on the right, whereas they are on the left. Bloch thought that the *Whiff* of Ray and Pennant was the *lævis*, but the Lævis is the *Kitt* of those authors—a single glance at the first plate of Ray, where they are both figured, will convince any one of the fact. Add: *Pl. triocellatus*, Schn., Russ., 76;—*Pl. maculosus*, Cuv., Russ., 75;—*Pl. aquosus*, Mitch., pl. ii, f. 3;—*Pl. Boscii*, Riss., Ed. I, pl. viii, f. 33;—*Pl. aramaca*, Cuv., Marcgr., 181, very different from the *Pl. macrolepidotus*, which is not from Brazil, but from the Mediterranean, and with which Bloch has confounded it.

SOLEA, CUV.

The mouth twisted to the side opposite to the eyes, and on that side only furnished with very minute and crowded teeth, the opposite one being edentated. The form is oblong; snout rounded, and generally projecting beyond the mouth; the dorsal commencing at the mouth, and extending, as well as the anal, to the caudal; lateral line straight; side of the head opposite to the eyes usually covered with a sort of villosity. The intestine is long and has several flexures, but no cæcum.

Pl. solea, L.; Bl., 45. (The Sole.) A well known and common species; brown on the side in which the eyes are placed; pectorals spotted with black, &c.—an excellent fish.

There are several other species, particularly in the Mediterranean.(2)

In some foreign species there is no distinction between the three vertical fins.(3)

MONOCHIRUS, CUV.

One extremely small pectoral on the side with the eye, the opposite one almost imperceptible or totally wanting.

Pleur. microchirus, Laroche, Ann. Mus. XIII, 356; *Linguatula*, Rondel., 324. A Mediterranean species.(4)

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(1) *Pleur. podas*, Laroche, Ann. du Mus, XIII, xxiv, 14, or *Pl. rhomboïdes*, Rondel, 313, which is also the same as the *Pl. argus* and *mancus* of Risso, Ed. I; *Pleur. mancus*, Brousson. Dec. Ictht., pl. iii, iv;—*Pl. argus*, Bl., and *lunatus*, Gm., Bl. 48, or better Catesby, Carol., XXVII.

(2) The *Pole* of Bélon, 143, and of Rondel., 323, different from the one sold at Paris, which is a Platessa, according to these authors, has the eyes on the left; I am not sure it is the *Rh. polus*, Riss., Ed. II, f. 32, in which the eyes are on the right;—the *Pl. ocellatus*, Sch., 40, the same as the *Pl. Rondeletii*, Sh., *Solea oculata*, or *Pégouze*, Rondel., 322;—*Pl. lascaris*, Risso, Ed. I, pl. vii, f. 32, and other foreign species to be described in our Hist. des Poissons.

(3) *Pl. zebra*, Bl., 187;—*Bl. plagiusa*, L.;—*Pl. orientalis*, Schn., 157;—*Pl. Commersonien*, Lac., III, xii, 2, or *Jerré potoo*, A, Russel, 70; but the description Lacep., IV, 658, belongs to another species of the subgenus Rhombus;—the *Horned-sole*, Russ., 72, an incorrect figure;—*Pl. jerreus*, Cuv., or *Jerré potoo*, B, Russel, 71;—*Pl. pan*, Buch., XIV, 42.

(4) It is probably the *Pleur. maugilii*, Risso, 310. Other species exist, some of which are unquestionably confounded with the Achiri of authors. The *Pl. trichodactylus*, must also belong to this subgenus. Add the *pegouze* of Risso, 308, Ed. II, f. 33;—*Mon. theophila*, Id.

Achirus, Lacep.

Soles totally deprived of pectorals.

They may also be divided into Achirus properly so called,(1) in which the vertical fins are distinct; and into Plagusia, Brown,(2) in which they are united with the caudal.

FAMILY III.

DISCOBOLI.

These fishes, so called on account of the disk formed by their ventrals, form two genera.

Lepadogaster, Gouan.

The small fishes which compose this genus are remarkable for the following characters. Their ample pectorals having reached the inferior surface of the trunk, assume stouter rays, curve slightly forwards, and unite with each other on the throat by a transverse membrane directed forwards, which is formed by the union of the ventrals. The body is smooth and without scales, the head broad and depressed, the snout salient and protractile; the branchiæ, but slightly cleft, are furnished with four or five rays, and they have but a single soft dorsal opposite to a similar anal. The intestine is short, straight and without cæca, and notwithstanding they are deprived of a natatory bladder, they may be seen swimming along the shores with great vivacity. In

Lepadogaster, properly so called,

The membrane which represents the ventrals extends circularly under the pelvis and forms a concave disk; on the other side the bones of the shoulder project slightly behind, which completes a second disk by means of the membrane which unites the pectorals. Several species inhabit the seas of Europe.

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(1) *Pl. achirus*, L., *Achire barbu*, Geoff., Ann. du Mus., vol. I, pl. xi. It is not the same as that of Lacep. It is necessary to observe that its barbs are not rays, but cilia, such as are found in the common Sole, and on many of the Achiri;—the *Ach. marbré*, Lac., III, xii, 3, and IV, p. 660;—the *Ach. fascé*, Id., *Pl. lineatus*, Sloane, Jam., pl. 346; *Pl. mollis*, Mitch., II, 4.

(2) *Pl. bilineatus*, Bl., 188, or *Jerré potoo*, E, Russel, 74;—the *Ach. orné*, Lacep., IV, p. 663;—*Pleur. arel*, Sch., 159, *Pl. plagusiæ*, aff., Jam., Br. 445, different from the *Pl. plagiusa*, L.;—*Pl. potous*, Cuv., or *Jerré potoo*, D, Russel, 73.

In some, the dorsal and anal are separated from the caudal, with which, however, their membrane is sometimes continuous, but becomes narrower.(1)

In others, the three fins are united.(2) In the

GOBIESOX, Lacep.

There are none of these double borders, and consequently the interval between the pectorals and ventrals is not divided into a double disk, forming but a single large one cleft on the two sides, and extending itself there by membranes. The dorsal and anal are short and separate from the caudal, and the branchial openings much larger.(3)

CYCLOPTERUS, Lin.

This genus is well marked by the ventrals, whose rays, suspended round the pelvis, and united by a single membrane, form an oval and concave disk, used by the fish as a sucker to attach itself to rocks. The mouth is wide, and its jaws and pharyngeals furnished with small and pointed teeth; opercula small; branchiæ closed below, and provided with six rays; pectorals very large, and uniting almost beneath the throat, as if to embrace the disk of the ventrals. The skeleton hardens but little, and the skin is viscous, without scales, but studded with indurated granules. There is a large stomach with numerous cæca, a long intestine and a moderate natatory bladder. We divide it into two subgenera.

LUMPUS, Cuv.

The first dorsal more or less visible, although very low, and with simple rays; a second with branched rays opposite to the anal; the body is thicker.

Cyclopterus lumpus, L.; Bl., 90. (The Lumpsucker.) The first dorsal so enveloped in a thick and tubercular skin, that it has the appearance, externally, of being a simple dorsal hump; there are three ranges of thick conical tubercles on each side of it. It feeds on Medusæ and other gelatinous animals, particularly in the North. Its flesh is soft and insipid; heavy and with scarcely any means of defence, it becomes the prey of the Seal, Shark, &c. The male is said to keep careful watch over the fecundated eggs.(1)

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(1) *Lepadog. gouan*, Lacep., I, xxiii, 3, 4, or *Lep. rostratus*, Schn.;—*Lep. balbis*, Risso, pl. iv, f. 9, probably the same as the *Cyclopt. cornubicus*, Sh., or *Jura sucker*, Penn. Brit. Zool., No. 59;—*Lep. Decandolle*, Risso, p. 76.

(2) *Lepadogaster Wildenow*, Risso, p. 76.

(3) *Lepadogaster dentex*, Schn., Pall., Spic., VIII, 1, the same as the *Cyclopterus nudus*, Lin., Mus. Ad. Fred., XXVII, 1, and as the *Gobiésoce testar*, Lacep., II, xix, 1;—*Cyclopterus bimaculatus*, Penn., Brit. Zool., pl. xxii, f. 1;—*Cyclopterus littoreus*, Schn., 199.

Liparis, Arted.

A single dorsal which, as well as the anal, is rather long; the body smooth, elongated, and compressed behind.

Cycl. liparis, L.; Bl., 123, 3, 4. Inhabits the coast of France.(2)

Echeneis, Lin.

This genus, as well as that of Pleuronectes, might form a particular family in the order of the Malacopterygii Subrachiati. The fishes of which it consists are remarkable for a flattened disk placed upon their head, composed of a certain number of transverse, cartilaginous laminæ, directed obliquely backwards, dentated or spiny on their posterior edge, and movable, so that by creating a vacuum between them, or by hooking on to various bodies by means of the spines, they are enabled to attach themselves firmly thereto, a circumstance which gave rise to the fabulous saying, that the Remora possessed the power of suddenly stopping a vessel in the middle of its swiftest course.

Their body is elongated and covered with small scales; there is a small soft dorsal opposite to the anal; the top of the head is perfectly flat; the eyes are on the sides; the mouth cleft horizontally and rounded; the lower jaw projects beyond the other and is furnished, as are the intermaxillaries, with small teeth resembling those of a card; a very regular range of delicate teeth, that may be compared to cilia, runs along the edge of the maxillaries, which form the external border of the upper jaw; the anterior edge of the vomer is furnished with a band of teeth like those of a card, and its whole surface, which is wide, as well as the tongue, is asperous. They have eight branchiostegal rays; their stomach is a wide cul-de-sac; they have six or eight cæca, but no natatory bladder; their intestine is ample but short.

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(1) The *Cyclopterus pavonius* is a mere variety of age of the *vulgaris*. The *Cyclop. gibbosus*, Will., V, 10, f. 2, appears to be the vulgaris badly stuffed. Add the *Cyclcp. spinosus*, Schn., 46;—*Cyclop. minutus*, Pall., Spic., VII, iii, 7, 8, 9;—*Cyclop. ventricosus*, Id., Ib., II, 1, 2, 3?—*Gobius minutus*, Dan. Zool., CLIV, B.

(2) It is the same as the *Gobioïde smyrneén*; Lacep., Nov. Com. Petrop., IX, pl. ix, f. 4 and 6, and probably as the *Cyclop. souris*, Lacep., IV, xv, 3, and perhaps as the pretended *Gobius*, Dan. Zool., CXXXIV;—Add *Cyclop. montagui*, Wern. Soc., I, v, 1;—*Cyclop. gelatinosus*, Pall., Spic., VII, iii, 1;—*Gobius*, Dan. Zool., CLIV, A.

The species are not numerous; the most common one that inhabits the Mediterranean, *Echen. remora*, L.; Bl., 172, well known by the name of *Remora*, is the shortest, and has but eighteen laminæ in its disk. Another and longer species, *Ech. naucratus*, L.; Bl., 171, has twenty-two; and the third, the longest of all, *Ech. lineata*, Schn., Linn. Trans. pl. 17, has but ten.

We have discovered a species, *Ech. osteochir*, Nob., whose pectoral rays are osseous, compressed, and terminated by a slightly crenated palette.

ORDER IV.

MALACOPTERYGII APODES.

This order may be considered as forming but a single natural family, that of the

ANGUILLIFORMES.

Fishes with an elongated form, a thick and soft skin which almost renders its scales invisible, and but few bones. They have no cæca, but nearly all of them possess natatory bladders which frequently assume the most singular shapes. The great genus

MURÆNA, Lin.,

Is recognized by the little opercula concentrically surrounded by the rays, all of which are enveloped in the skin, which only opens at a considerable distance back by a hole or species of tube, an arrangement which, by more completely protecting the branchiæ, allows these fishes to remain some time out of water without perishing. Their body is long and slender; their scales, as if encrusted in a fat and thick skin, are only distinctly visible after desiccation; they have neither ventrals nor cæca, and their anus is placed far back. This genus has been successively separated into five or six genera, which we are compelled to subdivide still more.(1)

ANGUILLA, Thunb. and Shaw.—MURÆNA, Bl.

Eels are distinguished by the two-fold character of pectoral fins and of branchiæ opening under them on each side. Their stomach is a long cul-de-sac; their intestine straight, and their elongated natatory bladder is furnished near the middle with a peculiar gland.

ANGUILLA, Cuv.—MURÆNA, Lacep.

The dorsal and caudal evidently continued round the end of the tail, forming by their union a pointed caudal.

In the true Eels the dorsal commences at a considerable distance behind the pectorals.

In some, the upper jaw is the shortest.

The common Eels belong to this division. The French fishermen admit of four kinds, which they pretend constitute as many species, but which are confounded by authors under the name of *Muræna anguilla*, L.; they are the *Ang. vermiaux*, which is, I think, the most common; the *Ang. long bec*, whose snout is more pointed and compressed; the *Ang. plat bec*, or the *Grig-eel*, whose snout is more flattened and obtuse, and eye smaller; and the *Ang. pimperneaux*, or the *Glut-eel*, where the snout is shorter in proportion, and the eye larger.(2)

In others the upper jaw is longest.(3)

CONGER, Cuv.

The dorsal commencing close to the pectorals, or even on them; the upper jaw longest in all the known species.

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(1) In none of these fishes, to our knowledge, are the opercula or rays wanting, as some authors have thought. The common *Muræna* has seven rays on each side; the *Mur. colubrina* has twenty-five. These rays are even very strong in *Synbranchus*, where the operculum is also complete, and formed of all its usual portions. N.B. The ECHELUS, Rafin., Nov. Gen., p. 63, pl. xv, 1, 3, pl. xvi, f. 2 and 3, would be of two kinds, the first Eels, and the other Congers, without branchial opercula—but we doubt the truth of this character.

(2) We will give a comparative description of them, with exact figures, in our Icthyology.

(3) *Mur. longicollis*, Cuv.—Lacep., II, iii, 3, under the false name of *Muræna myrus*.

Mur. conger, L.; Bl., 155. (The Conger Eel.) Found in all the seas of Europe; it attains the length of five or six feet and the thickness of a man's leg; dorsal and anal edged with black; lateral line dotted with whitish. It is not in much request for the table.

Mur. myrus, L.; Rondel, 407.(1) The form of a Conger, but remains smaller; it is known by spots on the snout, a band across the occiput, and two rows of dots on the nape, all of a whitish colour.(2)

In some foreign Congers the dorsal commences even before the pectorals, or at least on their base.(3) The

OPHISURUS, Lacep.

Differs from the true Eels in the dorsal and anal, which cease before they reach the end of the tail, which is thus deprived of a fin, and terminates like a punch. The posterior orifice of the nostril opens on the very edge of the upper lip, and the intestines are similar to those of an Eel, a portion of them, however, extending into the base of the tail beyond the anus.

The pectoral fins of some are of the ordinary size; their teeth are trenchant and pointed.

Mur. serpens, L.; Salv., 57. (The Snake Eel.) Six feet and upwards in length, and of the thickness of a man's arm; brown above, silvery beneath; the snout slender and pointed; twenty rays in the branchial membrane. From the Mediterranean.(4)

In others the pectorals are so extremely small, as sometimes to have escaped the notice of observers. They connect the Eels with the Murænæ; their teeth are obtuse.(1)

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(1) *Myrus*, a fish so called by the ancients, which some have considered as the male of the Muræna; Rondelet was the first who applied it to this species, which is very distinct, although since Willughby, no one has properly described it but Risso; no drawing has been made of it.

(2) The Mediterranean produces other small species of Congers described by Laroche and Risso under the names of *Mur. balearica*, Lar., Ann. du Mus., XIII, xx, 3, or *Mur. cassini*, Risso, *Mur. mystax*, Lar., Ib., XXIII, 10;—*Mur. nigra*, Risso, p. 93. The *Mur. strongylodon*, Schn., 91, which is far from being a variety of *myrus* as that author supposes, should also be referred to them.—The *Anguille marbrée*, Quoy and Gaym., Zool., Voy. de Freycin., pl. 51, f. 2.

(3) *Mur. talabou*, Russel, 38;—*Mur. savanna*, Cuv., from Martinique;—the *C. à chapelet*, Krusenst., V, lx, 7.

(4) This is doubtless the place of *Mur. ophis*, Bl., 154, *Ophis hyala*, Buchan., pl. v, f. 5;—*Ophis longmuseau*, Quoy et Gaym., Zool. Voy. Freycin., pl. li, f. 1;—*Ophisurus guttatus*, Cuv., a new species from Surinam.

N.B. The COERUS, Rafin., Nov. Gen., p. 62, must be Ophisuri without branchial membranes; we fear there is some mistake in this as in his ECHELUS.

Muræna, Thunb.—Gymnothorax, Bl.—Murænophis, Lacep.

The Murænæ, properly so called, have no vestige of pectorals; their branchiæ open on each side by a small hole; their opercula are so thin, and their branchiostegal rays so slender and concealed under the skin, that able naturalists have denied their existence. The stomach is a short sac, and the natatory bladder small, oval, and placed near the upper part of the abdomen.

Those species which have a very visible dorsal and anal, are the *Murænophis* of Lacepede.

Some of them have a single row of sharp teeth in each jaw. The most celebrated is

> *M. helena*, L.; Bl., 153. Common in the Mediterranean; a fish much esteemed by the ancients, who fed it in ponds expressly constructed for that purpose. The history of Vædius Pollio, who caused his transgressing slaves to be flung alive into these ponds as food for the Murænæ, is well known. It attains a length of three feet and more, is mottled with brown and yellowish, and is excessively voracious.(2)

Others have two rows of sharp teeth in each jaw, independently of the one on the vomer.(3)

In a third kind there are two rows of round or conical teeth in each jaw: such is

> *M. unicolor*, Laroche, Ann. Mus., XIII, xxv, 15; *M. Christini*, Risso. From the Mediterranean; everywhere covered with close, small, brown points or lines, which give it the appearance of being uniformly brown.(4)

We find some which have a single row of lateral round teeth, and two rows also round on the vomer, the anterior ones conical.(5)

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(1) *Mur. colubrina*, Bodd., or *annulata*, Thunb., or *Murenophis colubrina*, Lac., V, xix, 1;—*Mur. fasciata*, Thunb.;—*Mur. nob. maculosa*, given under the name of *Ophisurus ophis*, Lacep., II, vi, 2;—the *Oph. atternan*, Quoy et Gaym., Zool. Freycin., pl. 45, f. 2.

(2) Add, the *M. moringa*, Cuv., of the Antilles, Catesb., II, xxi;—*M. punctata*, Bl., Schn.;—*M. meleagris*, Sh. or *M. pintade*, Quoy et Gaym., Voy. Freycin., pl. 52, f. 2;—*M. parthenon*, Id., Ib., f. 2;—*M. favaginea*, Bl., Schn., 105;—*M. pantherine*, Lacep., or *M. picta*, Thunberg.

(3) *Murenophis gris*, Lacep., V, xix, 3.

(4) The other species are new.

(5) *Murenophis étoilé*, Lacep., or *M. nebulosa*, Thunb., Seb. II, lxix, 1;—*M. ondulé*, Lac., V, xix, 2 (*M. catenatus*, Bl. Schn.);—*M. sordida*, Cuv., Seb. II, lxix, 4.

Another has two rows of lateral round teeth, and four rows, also round, on the vomer, forming a kind of pavement. The fins of this species are scarcely apparent.(1)

Finally, there are others which have several rows of teeth resembling those of a card: such is

M. saga, Risso, Ed. I, f. 39. From the Mediterranean; remarkable for its elongated, round and pointed jaws, and the extension of its tail into a very sharp point.(2) The

SPHAGEBRANCHUS, Bl.

Differs from a Muræna by the approximation of the branchial openings on the throat. The vertical fins, in several species, only begin to project near the tail; the snout is extended and pointed. The stomach is a long cul-de-sac, the intestine straight, and the bladder long, narrow and placed behind.

Some species are totally deprived of pectorals.(3)

Others have small vestiges of them.(4)

There are even some,—the APTERICHTHES, Dumer., CECILIA, Lacep., in which no vertical fin whatever can be perceived, and consequently are Fishes without fins.(5)

MONOPTERUS, Commers. and Lacep.

The two branchial apertures united on the throat in a transverse fissure, divided in the middle by a partition; the dorsal and anal only visible in the middle of the tail, and uniting at its point; teeth like those of a card in the jaws and palatines; six rays in each gill, and only three very small branchiæ.

M. javanensis, Lacep. The only species known; back green, and a fawn-coloured belly. From the Sunda islands.(6)

SYNBRANCHUS, Bl.—UNIBRANCHAPERTURUS, Lacep.

The branchial opening consisting of a single round or longitudinal aperture under the throat, common to both sides; no pectorals; vertical fins almost wholly adipose. The head is thick, the snout rounded, teeth obtuse, and the opercula partly cartilaginous; six strong branchial rays. The intestinal canal is perfectly straight; the only distinction between it and the stomach is, that the latter is a little more ample and has a valve at the pylorus. There is a long and narrow natatory bladder, but not cæcum. From the seas of hot climates.(1)

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(1) *Gymnomurène cerclée*, Lacep. V, xix, 4, or *M. zebra*, Shaw, Seb. II, lxx, 3.

(2) The *Nettasoma melanura*, Rafin., Caratt., pl. xvi, f. 1, is at least closely allied to this *Saga* of Risso. N.B. The *Dalophis* of Rafinesque, Caratt., pl. vii, f 2, 3, should be edentated Murænæ, but we do not know them.

(3) *Sphagebranchus rostratus*, Bl. 419, 2, and the *Leptocephalus Spallanzani*, Risso, 85;—*Cæcula pterygea*, Vahl., Mem. d'hist. Nat. de Copenh. III, xiii, 1, 2. *Manti-bukaropaumu*, Russel, I, 37.

(4) *Sphagebranchus imberbis*, Laroche, Ann. Mus., XIII, xxv, 18.

(5) *Muræna cæca*, L., Laroche, Ann., Mus. XIII, xxi, 6.

(6) I suspect it is the same fish figured by Lacep. V, xvii, 3, under the different name of *Unibranchaperture lisse*.

ALABES, CUV.

A common branchial aperture under the throat, as in Synbranchus; but the pectorals are well marked, and between them is a little concave disk. A small operculum and three rays are distinguishable through the skin; the teeth pointed, and the intestines as in synbranchus.

But a single small species is known; it inhabits the Indian Ocean.

It is immediately after this great genus of the Murænæ that should be placed a newly discovered fish, which is one of the most singular of the whole class; I mean the

SACCOPHARYNX, Mitch.—OPHIOGNATHUS, Harwood.

Whose trunk, susceptible of being so inflated as to resemble a thick tube, terminates in a very long and slender tail, surrounded by an extremely low dorsal and anal which unite at its point. The mouth, armed with sharp teeth, opens far behind the eyes, which are placed close to the very short point of the snout. The branchial aperture consists in a hole under the pectorals, which are very small.

This fish attains a large size, and appears to be voracious. It has only been seen in the Atlantic Ocean, floating on the surface by the dilatation of its throat.(2)

GYMNOTUS, Lin.(3)

The gills partly closed by a membrane, as in Anguilla, but opening before the pectorals; the anus very far forwards; anal fin occupying the greater part of the inferior surface of the body, and most frequently extending to the end of the tail; no dorsal fin whatever.

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(1) *Synbranchus marmoratus*, Bl., 418;—*Synb. immaculatus*, Id. 419, *Unibranch. cachia*, Buchan., XVI, 4, *Dondoo-paum*, Russel, XXXV, has no appearance of a fin.

(2) The *Saccopharynx flagellum* of Mitchill was six feet in length, and the *Ophiognathus ampullaceus* of Harwood was four and a half. The first appeared to have no teeth in the lower jaw, and it is possible that these two fishes, although found in the same latitude, are different species; they evidently, however, belong to the same genus.

(3) *Gymnotus*, or, properly speaking, *Gymnonotus* (Bare-back), a name given to these fishes by Artedi.

GYMNOTUS, Lacep.

No fin at the end of the tail, under which extends the anal.

The TRUE GYMNOTI have no sensible scales; their intestines which have several flexures occupy but a moderate space; the cæca are numerous, and the stomach resembles a short obtuse sac strongly plaited within. One of their air vessels, cylindrical and elongated, extends very far behind in a sinus of the abdominal cavity, the other, oval and bilobate, composed of a thick substance, occupies the upper part of the abdomen, and is placed on the œsophagus. The species known inhabit the rivers of South America. The most highly celebrated is

G. electricus, L.; Bl., 156 (The Electrical Gymnotus); which, from its almost uniform shape and obtuse head and tail, has also been called the *Electrical Eel*. It is from five to six feet long, and communicates such violent shocks that men and horses are struck down by them. This power is dependent on the will of the animal, which gives it what direction it pleases, and renders it effective, even at a distance, killing fishes therewith, so situated. It is, however, dissipated by use, and to renew it, the Gymnotus requires rest and nourishing food.(1) The organ which is the seat of this singular faculty, extends along the whole under side of the tail, occupying about half its thickness; it is divided into four longitudinal fasciculi, two large ones above, and two smaller ones below, and against the base of the anal fin. Each bundle is composed of numerous parallel, membranous laminæ, nearly horizontal, and closely approximated to each other, one end terminating on the skin, and the other on the median vertical plane of the animal; they are united with each other by a multiplicity of small transverse and vertical laminæ. The little cells, or rather the little prismatic and transverse canals formed by these two kinds of laminæ, are filled with a gelatinous matter, and the whole apparatus receives a proportionably large number of nerves.(2)

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(1) See Humboldt, Zool. Obs., I, p. 49, et seq.

(2) See Hunter, Phil. Trans. vol. LXV, p. 395. Add the *Gymnotus æquilabiatus*, Humb., Zool. Obs., I, pl. x, No. 2, according to whose observations this species has no posterior natatory bladder.

CARAPUS, Cuv.(1)

A compressed and scaly body; the tail much narrowed behind. From the rivers of South America.(2)

We might, perhaps, distinguish from the common species those with an elongated snout only open at the end.(3)

STERNARCHUS, Schn.(4)—APTERONOTUS, Lacep.

The anal terminated before it reaches the end of the tail, which is furnished with a particular fin; a soft fleshy filament on the back, lodged in a groove running to the end of the tail and retained there by tendinous threads, which still allow it some degree of liberty, a singular mode of organization, the use of which cannot be divined.(5) The head is oblique, compressed, naked, and the skin prevents both the opercula and the rays from being seen externally; rest of the body scaly; teeth small and crowded, and on the middle of each jaw scarcely perceptible. The Sternarchi like the preceding fishes inhabit the waters of South America.(6)

GYMNARCHUS, Cuv.

The body scaly and elongated, and the gills slightly open before the pectorals as in Gymnotus; but a fin, with soft rays, occupies the whole length of the back; and there is none behind the anus, nor under the tail, which terminates in a point. The head is conical and naked, the mouth small, and furnished with a single row of small trenchant teeth.

G. niloticus. The only species known; discovered in the Nile by M. Riffault.

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(1) *Carapo*, according to Marcgrave, the name of these fishes at Brazil.

(2) *Gymnotus macrourus*, Bl., 157, 2; *Carapo*, Gm.;—*G. brachiurus*, Bl., 157, 1;—*fasciatus*, Gm.;—*G. albus*, Seb., III, pl. 32, f. 3.

(3) *Gymnotus rostratus*, Schn., pl. 106.

(4) *Sternarchus*, i. e. anus in the sternum.

(5) I rather think the separation is accidental, and that, in fact, it is one of the muscles of the tail, which, as the skin is weak in this particular place, is easily detached.

(6) *Gymnotus albifrons*, Pall., Spic. Zool., VIII, pl. vi, f. 1; Lacep. II, vi, 146, 3.

N.B. The *Gymnotus acus*, or *fierasfer*, belongs to the genus Ophidium, and the *Gymnotus notopterus*, Pall. and Gm., *Notoptère capirat*, Lacep., to the Herrings.

LEPTOCEPHALUS, Penn.

The branchial aperture before the pectorals; body compressed like a riband; head extremely small, with a short and somewhat pointed snout; pectorals almost imperceptible, or totally wanting; the dorsal and anal hardly visible, and uniting at the point of the tail. The intestines occupy but an extremely narrow line along the inferior edge.

L. morisii, Gm.; Lacep. II, iii, 2, inhabits the coast of France and England. Several other species, however, are found in the seas of hot climates, all of them as thin as paper and transparent as glass, so that even the skeleton is not visible. The profound study of their organization is one of the most interesting to which travellers can devote themselves.

OPHIDIUM, Lin.

The anus, as in Aguilla properly so called, far behind; the dorsal and anal fins united with that of the tail, and terminating the body in a point; the body so elongated and compressed that it has been compared to a sword, and invested like that of an Eel with small scales planted in the thickness of the skin. The Ophidii, however, differ from Eels in their well cleft branchiæ, which are furnished with a very apparent operculum and a membrane with short rays. Their dorsal rays are articulated, but not branched.

OPHIDIUM, Cuv.

Two pairs of small cirri under the throat, adhering to the point of the hyoid bone. Some of them are found in the Mediterranean.

O. barbatum, Bl., 59. Flesh-coloured; dorsal and anal bordered with black; the anterior cirri shortest; greatest length from eight to ten inches.

O. Vassalli, Risso. Brown; no edging on the fins; cirri equal. The stomach of these fishes is a thin oblong sac; their intestines, which have several flexures, are without cæca, their oval, large and very thick natatory bladder is supported by three peculiar bones suspended under the first vertebræ, the middle one one of which is moved by its proper muscles. Their flesh is good.

O. brevibarbe, Cuv. A third species from Brazil; brown, with shorter cirri.

O. blacodes, Schn., 484.(1) From the South Seas; a very large rose-coloured species, spotted with brown.

FIERASFER, Cuv.

No cirri, and the dorsal so thin that it seems to be a mere fold of the skin; the natatory bladder supported by two bones only, the middle one being wanting.

One species is found in the Mediterranean,—*Ophidium imberbe*, L.,(2) whose teeth are small and crowded, and another,—*Oph. dentatum*, Cuv., which has two hooked teeth in each jaw. They are very small fishes.

AMMODYTES, Lin.

An elongated body like that of the preceding fishes, provided with a fin, having articulated but simple rays, occupying a great part of the back, with a second behind the anus, and with a third, which is forked, at the end of the tail; these three fins, however, are separated by free spaces. The snout is acute; the upper jaw susceptible of extension, and the lower one, when at rest, longer than the other. The stomach of these fishes is fleshy and pointed; they have neither cæca nor natatory bladder, and they live in the sand, whence they are taken after the tide has ebbed.

Two species are found on the coast of France which were long confounded under the common name of *Ammodytes tobianus*, L., but which have lately been distinguished.(3) They are:

A. tobianus, Bl., 75, 2; Ray., I; Synop., III, f. 12. The lower jaw most pointed; the maxillaries longest; pedicles of the intermaxillaries very short; the dorsal commencing opposite to the end of the pectorals; and

A. lancea, Cuv. Penn. Brit. Zool. pl. xxv, f. 66. The maxillaries shorter; pedicles of the intermaxillaries longer; the dorsal commencing opposite to the middle of the pectorals; the body thicker in proportion.

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(1) Add the *Ophidium barbatum*, Mitch., I, f. 2, which appears to be a distinct species.

(2) It is the *Gymnotus acus*, Gm., and the *Notoptère fontanes*, Risso, Ed. I, pl. iv, f. 11.

With the *Ophidium imberbe* of the northern Icthyologists, such as Schonefeldt, Montag., Werner. Soc. I, pl. ii, f. 2, and the *Ophidium viride*, Fab., Faun. Groenl. 148, I am unacquainted; I believe them, however, to be allied to the Eels.

The *Ophidium ocellatum*, Tiles., Mém. Ac. Petersb., III, pl. 180, iii, 27, seems to me to approach the Gunnelli.

(3) It is to M. Lesauvage, a learned physician of Normandy, that we owe this distinction, but he has transposed the name of tobianus. See the Bullet. des Sc. Sept. 1824, p. 141. There remains to be ascertained whether the *Ammodytes cicerellus*, Rafin., Caratt., pl. ix, f. 4, differs from the tobianus.

Both species are common along the whole coast of France; from eight to ten inches long, and of a silver-grey colour. They are esteemed as food, and are also used for bait.

ORDER V.

LOPHOBRANCHII.

All the fishes of which we have hitherto spoken, have not only a bony or fibrous skeleton, and complete and free jaws, but their branchiæ are uniformly composed of laminæ, or are pectiniform. In this order, however, we likewise find the jaws free and complete; but it is eminently distinguished by the gills, which instead of resembling, as usual, the teeth of a comb, are divided into small round tufts, arranged in pairs along the branchial arches, a structure of which no other fishes present any example. They are enclosed beneath a large operculum, tied down on all sides by a membrane which leaves only a single small orifice for the exit of the water, and exhibiting in its thickness only vestiges of rays. These fishes are also recognized by the scutellated plates of mail which cover their body, and usually render it angular. They are generally small, and almost without flesh. Their intestine is equal, and without cæca, and their natatory bladder thin, but proportionably large.

SYNGNATHUS, Lin.(1)

The Syngnathi constitute a numerous genus characterized by a tubular snout, formed, like that of the Fistularidæ, by the prolongation of the ethmoid, vomer, tympanals, preopercula, subopercula, &c., and terminated by an ordinary mouth, but one that is cleft almost vertically on its extremity. The respiratory aperture is near the nape, and the ventrals are wanting. There is a peculiarity in the generation of these fishes, whose ova slip into a pouch formed [illegible] by an inflation of the skin and are hatched there; this pouch, in some, is situated under the belly, and in others under the base of the tail; it splits spontaneously for the passage of the fry.

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(1) From σὺν and γνάθος (united jaws), a name composed by Artedi, who thought that the tube of the snout of these fishes was formed by the union of their jaws.

SYNGNATHUS, properly so called.

An extremely elongated and very thin body, differing but little in diameter throughout. Several species are found in the seas of Europe.

Some of them, besides their ventrals, have a dorsal, a caudal, and [illegible] an anal.(1)

In others the anal only is wanting.(2) In these two groups the pouch is situated under the tail.

Others again have neither anal nor pectorals, but are provided with a dorsal and caudal; their pouch is under the belly.(3)

A fourth kind are deprived of every fin but the dorsal.(4)

HIPPOCAMPUS, Cuv.

The trunk laterally compressed, and considerably more elevated than the tail; by curving after death the head and body assume some resemblance to the head and neck of a horse in miniature, whence their vulgar name of *Sea-Horses.* The edges of their scales are raised into ridges, and their salient angles into spines. The tail is without fins.

One species is found in the seas of Europe with a short snout, *Hipp. brevirostris*, Cuv., Will., pl. J, 25, fig. 3; and another with a longer snout, *Hipp. guttulatus*, Cuv., Will., J. 25, f. 5, both of which have only a few filaments on the snout and body. Others closely allied to these, are taken in the Indian Ocean.(5)

New Holland produces a larger one, which, from the leaf-like

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(1) *Syngnathus typhle*, L., Bl., 91, 1;—*Syng. acus*, L, Bl., 91, 2.

(2) *Syng. pelagicus*, Risso, p. 63;—*Syng. Rondeletii*, Laroche, Ann Mus., XIII, 5, 5, *viridis*, Risso, 65, Rondel., 229, 1;—*S. barbarus*, Penn, Brit. Zool., or *rubescens*, Risso.

(3) *Syng. æquoreus*, L., Montag., Werner. Soc., I, 4, f. 1.

(4) *Syng. ophidion*, L., Bl., 91, 3;—*Syng. papacinus*, Risso, IV, 7;—*Syng. fasciatus*, Id., Ib., 8.

(5) *Syng. longirostris*, Cuv., Will., J.; 25, f. 4, and other species to be described in our Icthyology.

Two of the genera, *Tetraodon* and *Diodon*, have the faculty of swelling themselves up like a balloon, by filling their stomach, or rather a sort of very thin and extensible crop, which occupies the whole length of the abdomen, and adheres closely to the peritoneum, a circumstance which has occasioned it to be considered at one time as the peritoneum itself, and at another as a species of epiploon, with air. When thus inflated, they roll over, and float on the surface, with the abdomen upwards, unable to direct their course; but they are extremely well defended while in this position by the erection of the spines with which their skin is everywhere furnished.(1) Their natatory bladder has two lobes, and their kidneys, which are placed very high up, have been erroneously taken for lungs.(2) They have but three branchiæ on each side,(3) and when captured they produce a sound which is occasioned by the air rushing out of their stomach. Each of their nostrils is furnished with a double fleshy tentaculum.

DIODON, Lin.

So called because the jaws are undivided and formed of one piece above and another below. Behind the trenchant edge of each of these pieces, is a round portion, transversely furrowed, which constitutes a powerful instrument of mastication.(4) The skin is everywhere so armed with stout pointed spines, that when inflated, they resemble the burr of a chesnut tree. A number of species inhabit the seas of hot climates.

Some of them have long spines supported by two lateral roots.

The most common of this group, *Diod. atinga*, Bl., 125, and better, Seb., III, xxiii, 1, 2. is more than a foot in diameter.(5)

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(1) See Geoffroy-St-Hilaire, Poiss. d'Eg., in the great work on that country. A similar disposition is observable in Chironectes.

(2) It is thus I explain the mistake of Schœpfer in the publications of the Nat. of Berlin, VIII, 190, and that of Plumier, Schn., 513, and doubtless that of Garden, Lin. Syst., Ed. XII, i, p. 348. As to the cellular organs mentioned by Broussonnet, Ac. des Sc., 1780, last page, there is nothing to be found which resembles them. The process of respiration in these fishes is similar in all things to that of others.

(3) An instance of this we have already seen in Lophius.

(4) Fossil jaws of this description are not uncommon.

(5) The *Diod. histrix*, Bl., 126, is the same species uninflated. To avoid all equivocation, I call it *Diodon punctatus*;—Add *Diod. spinosissimus*, Cuv., Mém.

which may be approximated to the Chondropterygii, with which it is allied by the imperfection of the jaws, and the tardy induration of the skeleton; this skeleton, however, is fibrous, and its whole structure is that of ordinary fishes. The most distinguishing character of the order consists in the maxillary bone being soldered to the side of the intermaxillary, which alone constitutes the jaw, and in the mode in which the palatine arch is connected with the cranium, which, being by a suture, consequently renders it immovable. Besides this, the opercula and rays are concealed under a thick skin, through which only a small branchial fissure is visible.(1) Of ribs, nothing is to be found but very small vestiges. There are no true ventrals. The intestinal canal is ample, but without cæca,(2) and in almost every instance there is a large natatory bladder.

This order comprises two very natural families, characterized by their mode of dentition.

FAMILY I.

GYMNODONTES.

The Gymnodontes have jaws, which, instead of teeth, are furnished with an ivory substance, internally divided into laminæ, whose ensemble resembles the beak of a Parrot, and which in fact consists of true teeth united, that succeed each other as fast as they are destroyed by trituration.(3) The opercula are small, and there are five rays on each side, all of which are but imperfectly seen. They live on Crustacea and fucus, their flesh is mucous, and that of several species is considered poisonous, at least in certain seasons.

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(1) This peculiar arrangement, indications of which are visible in the Chironectes, has led several naturalists to believe that both opercula and rays are wanting in the Plectognathi; it is a mistake, however, for they are provided with them like other fishes.

(2) Bloch erroneously attributes cæca to genus Dodon.

(3) See my Leçons d'Anat. Comp. vol. III, p. 125.

Two of the genera, *Tetraodon* and *Diodon*, have the faculty of swelling themselves up like a balloon, by filling their stomach, or rather a sort of very thin and extensible crop, which occupies the whole length of the abdomen, and adheres closely to the peritoneum, a circumstance which has occasioned it to be considered at one time as the peritoneum itself, and at another as a species of epiploon, with air. When thus inflated, they roll over, and float on the surface, with the abdomen upwards, unable to direct their course; but they are extremely well defended while in this position by the erection of the spines with which their skin is everywhere furnished.(1) Their natatory bladder has two lobes, and their kidneys, which are placed very high up, have been erroneously taken for lungs.(2) They have but three branchiæ on each side,(3) and when captured they produce a sound which is occasioned by the air rushing out of their stomach. Each of their nostrils is furnished with a double fleshy tentaculum.

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Some of them have long spines supported by two lateral roots.

The most common of this group, *Diod. atinga*, Bl., 125, and better, Seb., III, xxiii, 1, 2. is more than a foot in diameter.(5)

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(3) An instance of this we have already seen in Lophius.

(4) Fossil jaws of this description are not uncommon.

(5) The *Diod. histrix*, Bl., 126, is the same species uninflated. To avoid all equivocation, I call it *Diodon punctatus*;—Add *Diod. spinosissimus*, Cuv., Mém.

Others have short spines, proceeding from three diverging roots.(1)

Some again have spines as slender as pins or hairs.(2)

TETRAODON, Lin.

Jaws divided in the middle by a suture, so as to present the appearance of four teeth, two above and two below; spines small and low. Several species are said to be poisonous.

> *T. lineatus*, L.; *Fahaca* of the Arabs; *Flasco psaro* of the Greeks; *T. physa*, Geoff., Poiss. d'Egypt., I, 1; Rondel. 419. Back and flank longitudinally striped with brown and whitish. From the Nile, which, during its inundations, casts thousands of them on shore, where they serve as play things for the children.

Some of them have a laterally compressed body, and a somewhat trenchant back; their power of inflation must be less than the others. One of them is electrical.(3)

Mus., IV, p. 134, Seb., III, xxiv, 10;—*Diod. triedricus*, Cuv., Mém. Mus. IV, p. 133, Seb., II, xxiii, 4;—*D. nictemerus*, Cuv., loc. cit., IV, vii, 5;—*D. novem-maculatus*, Id., Ib., VI, 3;—*D. sex-maculatus*, Id., Ib., VII, 1;—*D. multimaculatus*, Id., Ib., 4.

(1) *Diod. tigrinus*, Cuv., Mém. Mus., IV, vi, 1, or *orbiculatus*, Bl., 127, Seb., III, xxiii, 3;—*D. rivulatus*, Cuv., Ib., 2, or *maculato-striatus*, Mitch., VI, 3, probably the *Orbe*, Lacep., I, xxiv, 3;—*D. jaculiferus*, Cuv., loc. cit., VII, 3;—*D. antennatus*, Id. Ib., 2.

(2) *Diod. pilosus*, Mitchil., I, 471.

(3) The head and tail of the fishes of this genus are generally smooth, but the rest of their body is rendered more or less rough, by the very small spines which arise from the skin. The various combinations of the smooth and rough parts, and the different configurations resulting from the more or less oblique form of their head, have allowed me to arrange them in the following manner:

I. Species with a short head, possessing the faculty of inflating themselves so as to attain a globular form.

1st. The entire body rough.

A. Immaculate;—*Tetr. immaculatus*, Lacep., I, xxiv, 1, Russel, I, 26.

B. With black spots;—*Tetr. moucheté*, Lacep., I, xxv, i, or *T. Commersonii*, Schn., Russ., I, 28;—*Tetr. fluviatilis*, Buchan, XXX, 1;—*Tetr. geometricus*, Bl., Schn., Catesb., II, xxviii.

C. With black bands;—*Tetr. fahaca*, or *T. physa*, Geoff., Poiss. d'Eg., I, 1;—*T. lineatus*, Bl., 141, to which the *Tetr. psittatus*, Bl., Schn., 95, is at least closely allied.

D. With pale spots;—*Tetr. testudineus*, Bl., 139, of which the *T. reticularis*, Bl., Schn., appears to be a variety;—*T. hispidus*, Lacep., I, xxiv, 2, and Geoff. Poiss., d'Eg., I, 2;—*T. patoca*, Buchan, XVIII, 2.

2d. The entire body smooth: *T. lævissimus*, Bl., Schn.;—*T. cutcutia*, Buchan, XIII, 3.

Cephalus, Sh.—Orthagoriscus, Schn.

Jaws undivided as in Diodon; but the body, compressed and spineless, is not susceptible of inflation, and the tail is so short and high that this fish resembles one whose posterior portion has been truncated, producing a singular appearance, that is amply sufficient to distinguish it. The dorsal and anal, both high and pointed, are united to the caudal; the natatory bladder is wanting; the stomach is small and penetrated directly by the ductus choledocus. A thick layer of a gelatinous substance is spread under the skin.

C. brevis, Sh.; *Tetr. mola*, L.; Bl., 128.(1) (The Short Sun Fish.) Four feet and more in length, and weighing upwards of three hundred pounds; the skin is very rough, and of a fine silver colour. European seas.

C. oblongus; *Orthagoriscus oblongus*, Bl., Schn., 97. (The Oblong Sun Fish.) Skin hard, and divided into small angular compartments. Cape of Good Hope.

C. spinosus; *Orth. spinosus*, Bl. Schn.; *Diodon mola*, Pall., Spic. Zool., VIII, pl. iv, f.; and better, Kælr., Nov. Com. Petrop. X, pl. viii, f. 3. A third and very small species, with a few spines, that is sometimes taken in the Atlantic.

3d. The flanks only smooth, and with lateral tentacula: *T. Spengleri*, Bl., 144, Seb., III, xxiii, 7 and 8, the same as the *Tetr. Plumieri*, given from Plumier, Lacep., I, xx, 3. N.B. That what Lacépède considered a lump is only the pectoral of the other side, the point of which is visible, and that the *Sphéroïde tuberculé*, Lacep., II, 1, is drawn from the same plate of Plumier, and represents the same fish seen in front. Schneider was aware of this, Bl., Schn., Ind. pl. vii.—*T. honkenii*, Bl., 143.

4th. Smooth flanks, without lateral tubercles: *T. ocellatus*, Bl., 145;—*T. turgidus*, Mitch., pl. vi, f. 5;—*T. lunaris*, Russel, I, 29.

II. Species with an oblong head.

1st. The flanks only smooth: *T. argentatus*, Lacep., Ann. Mus. IV, xiii.

2d. Back and flanks smooth, the belly only rough: *T. lagocephalus*, Bl., 143, and Seb. III, xxiii, 5 and 6;—*T. lævigatus*, Will., pl. J. 2.

III. With a carinated back. *T. rostratus*, Bl., 146, 2, to which the *T. electricus*, Paters. Phil. Trans., vol. 76, pl. 3, is closely allied;—*T. Gronovii*.

(1) Add *Ort. oblongus*, Schn., 97;—*Ort. varius*, Lacep., I, xxii, 2;—*Ort. hispidus*, Nov. Com., Petr., X, viii, 2 and 3.

N.B. The *Ovoïde fascé*, Lacep., I, xxiv, 2, the *Ovum Commersoni*, Schn., 108, was described and figured by Commerson from a stuffed specimen which he himself suspected was a *mutilated Tetraodon*, and which, in fact, is a *Tetraodon lineatus* that had lost its fins.

The *Sphéroïde tuberculé* was given, as we have stated, from a drawing of Plumier, which represents a front view of a Tetraodon whose vertical fins are not visible. Conf., Schn., index, LVII. These two genera must consequently be suppressed.

TRIODON, Cuv.

We also make a separate genus of these fishes, whose upper jaw is divided as in Tetraodon, and the lower one single, as in Diodon. An enormous dewlap, almost as long as the body and twice as high, is supported before by a very large bone which represents the pelvis and approximates them to certain Balistes. Their fins are those of a Diodon, their body is rough as in Tetraodon, and the surface of their dewlap is covered with numerous, small, rough crests, placed obliquely.

T. bursarius, Reinw.; *Triod. macroptère*, Less. and Garn., Voy. de Duper., Poiss. No. 4. The only species known; it was discovered in the Indian Ocean by M. Reinward.

FAMILY II.

SCLERODERMI.

The second family of the Plectognathi is easily distinguished by a conical or pyramidical snout, prolonged from the eyes and terminated by a small mouth, armed with a few distinct teeth in each jaw. The skin is usually rough or invested with hard scales; the natatory bladder is oval, large, and strong.

BALISTES, Lin.(1)

The body compressed; eight teeth in a single row in each jaw, generally trenchant; the skin scaly or granulated, but not exactly osseous; the first dorsal composed of one or more spines articulated with a particular bone which is attached to the cranium, marked by a furrow into which they are received; the second dorsal long, soft, and placed opposite to a nearly similar anal. Although the ventrals are wanting, a true pelvic bone is observed in the skeleton suspended to the shoulder.

These fishes abound in the torrid zone, near rocks and on the surface of the water, where they display their brilliant colours. Their flesh, which is but lightly esteemed at all times, becomes, it is said, poisonous during the period in which they feed on the coralline Polypi; fucus is all that I met with in those I opened.

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(1) *Balistes*, a name given to these fishes by Artedi, from their Italian appellation *Pesce balestra*, which is itself derived from a supposed similitude between the motion of their great dorsal spine and that of a cross-bow.

Balistes, proper.

The entire body covered with very hard, large, rhomboidal scales which do not overlap, and have the appearance of compartments of the skin; the first dorsal has three spines, the first of which is much the longest, and the third very small and placed far back; the extremity of the pelvis is always salient and prickly, and behind it are some spines involved in the skin, which, in the long species, have been considered as rays of ventrals.

Some of them have no peculiar caudal armature, and of these again, some have scales behind the gills which are no larger than the others. Such is a species that inhabits the Mediterranean, the

B. capriscus, L.; Salv., 207, and Will., I, 19; *Pourc, Pesce balestra*, &c. (The Mediterranean File-Fish.) Brownish-grey, spotted with blue, or greenish. Its flesh is not esteemed.(1)

Others, with this unarmed tail, have scales behind the gills which are larger than the rest.(2)

In the greater number, the sides of the tail are armed with a certain number of rows of spines bent forwards, and all those of this division with which we are acquainted, have scales behind the gills larger than the others.(3)

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(1) I suspect the *B. maculatus*, Bl., 151, is the same as the *capriscus*. I am even inclined to believe that such is also the case with the *B. bunira*, Lacep, V, xxi, 1;—Add, *Bal. stellaris*, Schn., Lacep., I, vi;—*Bal. sufflamen*, Mitch., VI, 2;—*Bal. jellaka*, Cuv., *Lamnayellaka*, Russel, I, 22.

(2) *Bal. forcipatus*, Will., I, 22;—*Bal. vetula*, Bl., 150;—*Bal. punctatus*, Gm., Will., App. 9, f. 4;—We might also distinguish the *Bal. noir*, Lacep., I, xv, remarkable for its upper lateral teeth, which are prolonged into canini, aad for the great forks of its tail. N.B. The *B. niger*, Schn., does not differ from the Ringens;—*Bal. fuscus*, Schn., or *B. grandes taches*, Lacep., I, 573, remarkable for its naked cheeks furnished with rows of tubercles.

(3) Species with two or three rows of spines. *Bal. lineatus*, Schn., 87, Renard, 217, or *B. lamouroux*, Quoy and Gaym., Voy. Freycin., pl. 47, f. 1; *Bal cendré*, Lacep., I, xvii, 2, or *B. arcuatus*, Schn., Journ. de Phys., Juillet, 1774.

Species with three rows. *Bal. aculeatus*, L., Bl., 149, Lac., I, xvii, 1, Renard, I, 28, f. 154, and II, 28, f. 136;—*Bal. verrucosus*, L., Mus. Ad. Fred., XXVII, 57, the same as *B. pradin*, Lacep., I, 335, and the *B. viridis*, Schn.

Species with four or five rows. *Bad. écharpe*, Lacep., I, xvi, 1, or *Bal. rectangulus*, Schn., or *Bal. medinilla*, Quoy and Gaym., Zool., de Freycin., pl. 46, f. 2;—*Bal. conspicillum*, Schn., Renard, I, 15, f. 88, and Lacep., I, xvi, 3, under the improper name of *Baliste americain*—it is from the Indian Ocean;—*B. viridescens*, Schn., or *verdâtre*, Lacep., I, xvi, 3.

Monocanthus, Cuv.

Very small scales, covered with stiff and thickly set asperities, like the pile on velvet; extremity of the pelvis salient and spinous as in the true Balistes; a single large serrated spine in the first dorsal, or at least the second one is almost imperceptible.

In some of them the pelvic bone is very movable and is connected with the abdomen by a sort of extensible dewlap; strong spines are frequently observed on the sides of their tail.(1)

Others are distinguished by the sides of their tail being bristled with stiff setæ.(2)

Some, because their body is completely covered with small pediculated tubercles.(3)

Others again, because that same part is furnished with slender and frequently branched cilia.(4)

A fifth kind have none of these various characters.(5)

Aluteres, Cuv.

An elongated body covered with small and scarcely visible granules; a single spine is the first dorsal; the chief character is in the

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Species with six or seven rows. *Bal. armé*, Lacep., XVIII, 2. N.B. It is neither the *armatus* of Schn., nor, as he supposes, his *chrysopterus*;—*Bal. ringens*, Bl., 152, 2, or *niger*, Schn., or *sillonné*, Lacep., I, xviii, 1.

Species with twelve or fifteen rows. *Bal. bursa*, Schn.; *B. bourse*, Lacep., III, 7, Renard, I, 7, and Sonnerat, Journ. de Phys., 1774.

Species in which the spines are not very sensible, and are reduced to small tubercles. *Bal. bridé*, Lacep. I, xv, 3;—*Bal. etoilé*, Lacep., I, xv, 1, or *B. stellaris*, Schn., or *Dondrum yellakah*, Russel, XXIII.

N.B. If the Balistapus of Tilesius, Mem. Acad. Petersb., VII, ix, actually want the pelvis, it will form a subgenus immediately after the true Balistes.

(1) *Balistes chinensis*, Bl., 152, 1;—*Bal. tomentosus*, Id., 148, which is not that of Linnæus, but the *Pira aca*, Marcgr., 154;—*Bal. japonicus*, Tiles. Mem. Soc. Moscow, vol. II, pl. 13;—*Bal. pelleon*, Quoy and Gaym., Zool. de Freycin., pl. 45, f. 3;—*Bal. geographicus*, Per., Cuv., Regn. Animal, pl. ix, f. 2.

(2) *Bal. tomentosus*, L., Seb., III, xxiv, f. 18, Gronov., Mus., VI, f. 5;—*B. à brosses*, *Bal. scopus*, Commers., Lacep., I, xviii, 3, agreeing with the description given by Linnæus of the *hispidus*, but neither with the character nor figure quoted by Seba.

(3) *Bal. papillosus*, Schn., White, p. 254.

(4) *Bal. penicilligerus*, Péron., Cuv., Regne Animal, pl. ix, f. 3;—*Bal. villosus*, Ehrenb.

(5) *Bal. hispidus*, L., Seb., III, xxxiv, 2;—*Bal. longirostris*, Schn., Seb., III, xxiv, 19;—*Bal. papillosus*, L.? Lacep., I, xvii, 3, under the name of *monoceros*, Clus., Exot., lib., VI, cap. xxviii;—*Bal. villosus*, Cuv.:—*Bal. guttatus*, Id.

pelvis, which is completely hidden under the skin and is without that spinous projection observed in the other Balistes.(1)

TRIACANTHUS, CUV.

Is distinguished from all other Balistes by a kind of ventrals, each of which is supported by a single large spinous ray, adhering to a non-salient pelvis. The first dorsal has three or four small spines behind a very large one. The skin is crowded with small scales, and the tail is longer than in the other subgenera.

But a single species is known; it inhabits the Indian Ocean.(2)

OSTRACION, Lin.

The head and body of these fishes, instead of scales, are covered with regular bony plates soldered in such a manner as to form a sort of inflexible shield, which invests them, so that the only movable parts are the tail, fins, mouth, and a sort of small lip with which the edge of their gills is furnished, all passing through holes in this coat of mail. The greater number of their vertebræ are also soldered together, and each of their jaws is armed with ten or twelve conical teeth. The external branchial aperture is a mere slit furnished with a cutaneous lobe, but internally we find an operculum and six rays. Both the pelvis and ventrals are wanting, and there are but a single dorsal and ventral, both small.

They have but little flesh; their liver, however, is large and produces much oil. Their stomach is membranous and large; some of them are considered poisonous.

They may be divided according to the form of their body and the spines with which it is armed; we are not certain, however, that there is not, in this respect, some sexual difference.(3)

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(1) *Bal. monoceros*, L., Catesb., 19;—the *monoceros* of Bl., which is different, 147;—*Bal. lævis*, Bl., 414;—*Acaramucu*, Marcgr., 163, also differing from the three preceding ones;—*Bal. Kleinii*, Misc. III, pl. iii, f. 2;—*Al. cryptacanthus*, Cuv., Ren., II, part of pl. xlii, f. 284.

(2) *Bal. biaculeatus*, Bl., 148, 2.

Numerous species of all these subgenera will be described in our Hist. des Poissons.

(3) 1st. A triangular body without spines. *Ost. triqueter*, Bl., 130;—*Ost. concatenatus*, Bl., 131.

2d. A triangular body armed with spines behind the abdomen. *Ost. bicaudalis*, Bl., 132;—*Ost. trigonus*, Bl., 135.

3d. A triangular body armed with spines before and behind the abdomen. *Ost. quadricornis*, Bl., 134.

4th. Triangular, the ridges armed with spines. *Ost. stellifer*, Schn., 97; the same as the *Ost. bicuspis*, Blumenb., Abb., 58.

CHONDROPTERYGII.

The second series of the class of fishes, or the Chondropterygii, can neither be considered as superior nor inferior to that of the ordinary fishes, for several of its genera approach the Reptiles in the conformation of the ear and of the genital organs, while in others the organization is so simple, and the skeleton so much reduced, that we might be excused for hesitating to place them among vertebrate animals. It is therefore a suite somewhat parallel to the first, as the Marsupialia, for instance, are parallel to the other unguiculated Mammalia.

The skeleton of the Chondropterygii is essentially cartilaginous; that is, it contains no osseous fibres, the calcareous matter being deposited in small grains, and not in filaments; hence the absence of sutures in their cranium, which is always formed of a single piece, but in which, by means of projections, depressions, and holes, regions analogous to those in the cranium of other fishes may be distinguished. It sometimes happens that movable articulations, which are found in other orders, are not met with in this one; part of the vertebræ of certain Rays, for instance, being united in a single body. Some of the articulations of the bones of the face also disappear, and the most apparent character of this division consists in the absence of the maxillaries and intermaxillaries, or rather in

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5th. Triangular, without spines. *Ost. cubicus*, Bl., 137;—*Ost. punctatus* and *lentiginosus*, Schn., Seb., III, xxiv, 5; Lacep., I, xxi, 1, or *meleagris*, Sh., Gen. Zool., V, part II, pl. 172;—*Ost. nasus*, Bl. 138, Will., I, ii;—*Ost. tuberculatus*, Will. I, 10.

6th. A triangular body armed with spines before and behind the abdomen. *Ost. cornutus*, Bl., 133.

7th. A quadrangular body, the ridges armed with spines. *Ost. diaphanus*, Schn., p. 501;—*Ost. turritus*, Bl., 136.

8th. A compressed body, with a carinated abdomen and scattered spines. *Ost. auritus*, Sh., Nat. Misc., IX, No. 338, and Gen, Zool., V, part II, pl. lviii, 1, and some neighbouring species.

N.B. The *Ost. arcus*, Seb. III, xxiv, 9, is perhaps a mere variety of the *cornutus*, and the *gibbosus*, Aldrov., 561, appears to me to be a badly drawn triqueter.

their reduction to mere vestiges concealed under the skin, while their functions are fulfilled by bones analogous to the palatines, and even sometimes by the vomer. The gelatinous substance, which in other fishes fills the intervals of the vertebræ, and only communicates with them by a small hole, forms a long cord in several of the Chondropterygii, which traverses the bodies of almost all the vertebræ, without scarcely varying in diameter.

This series is divided into two orders—the Chondropterygii whose branchiæ are free, like those of ordinary fishes, and those in which they are fixed, that is to say, attached to the skin by their external edge in such a manner that the water can only escape from their intervals through holes on the surface.

ORDER I.

STURIONES, OR CHONDROPTERYGII BRANCHIIS LIBERIS.

Or Chondropterygii, with free branchiæ, which are still closely allied to the ordinary fishes in their gills, which have but a single wide opening, and are furnished with an operculum, but without rays in the membrane. This order comprises but two genera.

ACIPENSER, Lin.(1)

The general form of the Sturgeon is similar to that of the Shark, but the body is more or less covered with bony plates in longitudinal rows; the exterior portion of the head is also well mailed; the mouth, placed under the snout, is small and edentated; the palatine, soldered to the maxillaries, converts them into the upper jaw, and vestiges of the intermaxillaries are found in the thickness of the lips. This mouth, placed on a pedicle that has three articulations, is more protractile than that of the Shark. The eyes and nostrils are on the side of the head, and cirri are inserted under the snout. The labyrinth is perfectly formed in the cranial bone, but there is no vestige of an external ear. A hole perforated behind the temple is a mere spiracle, which leads to the branchiæ. The dorsal is behind the ventrals, and the anal under it. The caudal surrounds the extremity of the spine and has a salient lobe beneath, shorter, however, than its principal point. Internally, we already find the spinal valve of the intestine and the united pancreas of the Selachii, but there is, moreover, a very large natatory bladder, which communicates with the œsophagus by a wide hole.

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(1) *Acipenser* is the ancient name; *Sturio*, whence *Sturgeon*, is modern, and is probably the German name *Stoer* latinized.

The Sturgeon ascends certain rivers in great numbers, and is the object of important fisheries; the flesh of most species is agreeable, their ova are converted into caviar, and their natatory bladder into isinglass. Western Europe produces

A. sturio, L.; Bl., 88. (The Common Sturgeon.) Six or seven feet long; snout pointed; plates strong and spinous, arranged in five rows; the flesh resembling veal.

The rivers which empty into the Black and Caspian seas, in addition to the sturio, produce three other species, and perhaps more.(1)

A. Ruthenus, L.; *A. pygmæus*, Pall., Bl., 89. (The Sterlet.) Seldom more than two feet in length; plates of the lateral rows more numerous and carinated, those of the belly flat. It is considered a delicious fish, and its caviar is reserved for the Russian court. There is reason to believe that it is the *Elops* and the *Acipenser*, so highly celebrated among the ancients.(2)

A. helops, Pall.; *A. stellatus*, Bl. Schn.; Marsill., Dan. IV, xii, 2; the *Scherg* of the Germans; *Sevreja* of the Russians. Four feet in length, and has a longer and more slender snout, and rougher plates than the others. This species is excessively numerous, but is less valued than the Sturgeon.

A. huso, L.; Bl., 129; the *Hausen*, &c. (The Great Sturgeon.) Blunter plates and a shorter snout and cirri than those of the Common Sturgeon; the skin also is smoother. It is frequently found to exceed twelve and fifteen feet in length, and to weigh more than twelve hundred pounds. One specimen was captured whose weight amounted to near three thousand pounds. The flesh is not much esteemed, and is sometimes unwholesome, but the finest isinglass is made from its natatory bladder. It is also found in the Po.

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(1) The various species of the Sturgeon are not yet well determined, and even Pallas, who knew more of them than any one else, does not give them sufficiently distinct comparative characters; he does not agree either with Kramer, Guldenstedt, or Lechepin. The figures of Marsigli, on the other hand, are too coarse. We expect better ones from the learned Austrian naturalists, to whom the Danube offers abundance of these fishes.

(2) See my note on Pliny, Lemaire's Ed. vol. II, p. 74.

North America has several species of this genus which are peculiar to it.(1)

POLYODON, Lac.—SPATULARIA, Sh.

These fishes are recognized at once by the enormous prolongation of their snout, to which its broad borders give the figure of a leaf. Their general form and the position of their fins, remind the observer of a Sturgeon, but their gills are still more open, and the operculum is prolonged into a membranous point which extends to near the middle of the body. The mouth is well cleft and furnished with numerous small teeth. Their upper jaw is formed by the union of the palatines with the maxillaries, and the pedicle has two articulations. The spine of the back is furnished with a cord like that of the lamprey; and the spiral valve, common to almost all the Chondropterygii, is found in the intestine, but the pancreas begins to be divided into cæca—they have a natatory bladder.

But a single species is known, the *Polyodon feuille*, Lacep., I, xii, 3; *Squatus spatula*, Manduit, Journ. de Phys. 1774, pl. 11. From the Mississippi.

CHIMÆRA, Lin.(2)

The Chimæræ are closely allied to the Sharks in their general form and in the position of their fins, but all their branchiæ open externally by a single apparent hole on each side, although if we penetrate more deeply, we find that they are attached by a large part of their edges, and that in fact there are five particular holes terminating in the bottom of the common aperture. A vestige of an operculum, however, is concealed under the skin. The jaws are still more reduced than in the Shark, for the palatine and tympanic bones are also mere vestiges suspended to the sides of the snout, and the vomer is the only representative of the upper jaw. Hard and indivisible plates supply the place of teeth, four on the upper jaw and two on the lower. The snout, supported like that of a Shark, projects forwards and is pierced with pores arranged in tolerably regular lines; the first dorsal, armed with a strong spine, is placed over the pectorals; the males are recognized, as among the Squali, by bony appendages of the ventrals, which are divided, however, into three branches, and they have besides, two spinous laminæ situated before the base of these same ventrals; a fleshy appendage between the eyes is terminated by a group of small spines. The intestine of the Chimæræ is short and straight, it is furnished, however, with the spiral valve, as in the Shark. They produce very large coriaceous eggs with flattened and hairy borders. In the

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(1) *Acip. oxyrhynchus*, Lesueur, Amer. Philos. Trans. new series, vol. I, p. 394;—*Acip. brevirostris*, Id. Ib. 390; *Ac. rubicundus*, Id. Ib. 388, and pl. xii, which appears to bear a close resemblance to the Sterlet;—*Ac. maculosus*, Id. Ib., 392, approaches the Common Sturgeon.

(2) This name was given to them on account of their fantastic figure, which, when they are carelessly dried, as was the case with the specimens first represented by *Clusius*, *Aldrovandus*, &c., appears monstrous.

CHIMÆRA, Cuv.

Or true Chimæra, the snout is simply conical; the second dorsal commences immediately behind the first and extends to the tip of the tail, which is drawn out in a long filament, and is furnished beneath with another fin similar to the caudal of a Shark. But one species is known.

> *C. monstrosa*, L.; Bl., 124, and Lacep., I, xix, 1, the female; vulg., *King of the Herrings;* the *Chat* of the Mediterranean. (The Arctic Chimæra.) Two or three feet long, of a silvery colour, and spotted with brown. From the Northern and European seas. In the

CALLORHYNCHUS, Gronov.

The snout is terminated by a fleshy appendage resembling a hoe as to form. The second dorsal commences over the ventrals and terminates opposite the beginning of the fin attached to the under part of the tail. But one species is known,

> *Chim. callorhynch.*, L.; Lacep. I, xii, a female. (The Antarctic Chimæra.) From the South Seas.

ORDER II.

CHONDROPTERYGII BRANCHIIS FIXIS,

Or the Chondropterygii with fixed branchiæ, instead of having those organs free on the external edge, and opening all their intervals into a large common orifice, as is the case in all the fishes of which we have hitherto spoken, have them adhering by this external edge in such a manner that they permit the water to escape through as many holes pierced in the skin as there are intervals between them, or, at least, that these holes may terminate in a common duct, through which the water is ejected. Another circumstance peculiar to these fishes is the presence of little cartilaginous bows, frequently suspended in the muscles opposite to the external edges of the branchiæ, and which may be termed branchial ribs.

FAMILY I.

SELACHII,—PLAGIOSTOMI, Dumer.

This family, hitherto comprized under two genera, SQUALUS and RAIA, has many common characters. The palatines and post-mandibularies, alone armed with teeth, supply the place of jaws, the usual bones of which are reduced to mere vestiges; one single bone suspends these apparent jaws to the cranium, representing at once the tympanal, jugal and temporal bones, and the preoperculum. The hyoid bone is attached to the single pedicle just mentioned, and supports branchiostegal rays, as in ordinary fishes, although they are not so very visible, externally; it is followed by the branchial arches, as usual, but neither of the three pieces compose the operculum. These fishes have both pectorals and ventrals: the latter are are situated behind the abdomen, and on each side of the anus. Their membranous labyrinth is enclosed by the cartilaginous substance of the cranium; the sac, which constitutes part of it, contains mere amylaceous masses, and not stones. The pancreas resembles a conglomerated gland, and is not divided into distinct tubes or cæca. The intestinal canal is short in proportion, but a portion of it is provided internally with a spiral lamina, which retards the expulsion of the aliment.

Fecündation is performed by an intromission of semen; the females have highly organized oviducts, which supply the place of a matrix in those whose young are hatched within their body; the others produce ova, invested with a hard or horny shell, to the formation of which a large gland that surrounds each oviduct contributes. The males are recognized by certain appendages, situated on the internal edge of the ventrals, which are very large, and highly complicated, and whose use is not well understood.

SQUALUS, Lin.(1)

The Sharks form a first great genus distinguished by an elongated body, a thick fleshy tail and moderate pectorals, so that the general figure approaches that of ordinary fishes; the branchial openings correspond with the sides of the neck, and not with the under surface of the body as we shall see is the case with the Rays; the eyes also are on the sides of the head. The snout is supported by three cartilaginous branches connected with the anterior part of the cranium, and the rudiments of the maxillaries, intermaxillaries, and premandibularies are evident in the skeleton.

The shoulder bones are suspended in the muscles behind the branchiæ without articulating either with the cranium or spine. Several are viviparous. The others produce ova invested with a yellow and transparent horn, the angles of which are prolonged into horny cords. The little branchial ribs are apparent, and there are also small ones along the sides of the spine, which is completely divided into vertebræ. The genus is very numerous and authorizes various subdivisions. We first separate the

SCYLLIUM, Cuv.(2)

Distinguished from other Squali by the short and obtuse snout, and by the nostrils opening near the mouth, continued in a groove extending to the edge of the lip, and more or less closed by one or two cutaneous lobules. The teeth have a point in the middle, and two smaller ones on the sides. There are spiracles and an anal fin; the dorsals are placed very far back, the first never being further forward than the ventrals; the caudal is elongated, not forked and truncated; the branchial apertures are partly under the pectorals.

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(1) *Squalus*, the Latin name of a fish, employed by some authors; the species, however, is unknown. Artedi applied it to this genus. We also find *Squalus* for *Squatina*.

(2) *Scyllium*, one of the Greek names of this fish.

In some of them the anal corresponds to the interval between the two dorsals: such are the two species of the coast of Europe that are frequently confounded, the

Sq. canicula, L.; *La Grande Roussette*; Bl., 114; Rondel., 380; Lacep. I, x, 1. Numerous small spots; the ventrals obliquely truncated.

Sq. catulus, and *stellaris*, L.; *La Rochier;* Rondel., 383; Lacep., I, ix, 2. Fewer but larger spots sometimes ocellated; ventrals cut square.

A third species from the same locality is marked with black and white spots.(1)

In others, all of them foreign to Europe, the anal is attached behind the second dorsal, the spiracles are singularly small; the fifth branchial opening is frequently concealed in the fourth, and the nasal lobules are usually prolonged into cirri.(2) Under the name of

SQUALUS, properly so termed,

We include all the species with a prominent snout, under which are placed nostrils neither prolonged in a furrow nor furnished with lobules; there is a lobule on the under part of the caudal which approximates it more or less to the bifurcated form. The old arrangement may be preserved which is founded on the presence or absence of the spiracles and anal; in order to make it a natural one, however, we must increase the number of its divisions.

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(1) Add the *Roussette* of Artedi, Risso, Ed. II, f. 5, or *Squalus prionurus*, Otto.;—the *Roussette of Gunner* (*Squalus catulus*, Gunn.), Mém. Soc. Dronth., II, pl. i, which appears to be a peculiar species;—the *Sq. Edwardsii* (Edw., 289), under the erroneous name of the *Greater Cat-fish*, which would indicate the Roussette, and which is improperly quoted as the pretended *Sq. stellaris;*—the *Sq. africanus*, or *galonné*, of Broussonnet (Sh., Nat. Misc. 346). N.B. That the term *longitudinalibus*, gratuitously added by Gmelin, is not correct;—the pretended *Sq. canicula*, Bl., 112, which is a distinct foreign species, unless it be a very uncommon variety of the Catulus.

(2) The *Sq. pointillé*, Lacep., II, iv, 3, the same as the *Sq. barbillon*, Brouss., (*Sq. barbatus*, Gm.), and as the *Sq. punctatus*, Schn., Parra., pl. 34, f. 2;—the *Sq. tigre*, Lac., or *Sq. fasciatus*, Bl., 113 (*S. tigrinus* and *S. longicaudus*, Gm.);—the *S. lobatus*, Schn., Phil. Voy. pl. 43, p. 285;—the *Bokee sorra*, Russ., Corom., XVI.

Species without spiracles, provided with an anal.

CARCHARIAS, Cuv.(1)

A numerous and by far the most celebrated tribe; with trenchant, pointed teeth, most commonly dentated on the margin. The first dorsal is far before the ventrals, and the second about opposite to the anal. The spiracles are wanting; the nostrils are placed under the middle of the depressed snout, and the last branchial apertures extend over the pectorals.

Sq. carcharias, L.; Belon, 60.(2) (The White Shark.) This species attains the length of twenty-five feet, and is recognized by its teeth, which in the upper jaw nearly form isosceles triangles with rectilinear and dentated sides. The lower ones consist of narrow points placed on wider bases, terrific weapons, which are the dread of mariners. It would appear that it inhabits every sea, but its name has frequently been applied to other species with trenchant teeth.

Sq. vulpes, L.; Rondel., 387. (The Fox Shark.) Teeth forming pointed isosceles triangles in each jaw, and particularly distinguished by the upper lobe of the tail, which is as long as the entire body. The second dorsal and anal, on the contrary, are extremely small.(3)

Sq. glaucus, L.; Bl., 86. (The Blue Shark.) Body slender, of a slate-blue above; pectorals very long and pointed; upper teeth forming curvilinear triangles bent outwards: the lower ones straighter, all of them dentated.(4) The

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(1) *Carcharias*, the Greek name of some large Squalus, synonymous with *Lamia*.

(2) N.B. This figure of Belon is the only good one. Most of the others are incorrect. Bl., 119, is a very different species, which appears more allied to Scymnus;—*Gunner*, Mem. of Dronth., II, pl. x and xi, the same described by Fabr., Groenl., 127, is another species also allied to Scymnus;—Rondel., 390, copied Aldrov., 383, is the *cornubicus*, as well as Aldrov., 388, where the anal is torn away and the jaws, Id., 382;—I will not name the monstrous figure of Gesner, 173, copied Will., B. 7;—Lacep., I, viii, 1, is the *Sq. ustus*.

(3) It is on this last character that the genus ALOPIAS, Raf., is founded.

(4) Add; *Sq. ustus*, Dum. (*Sq. carcharia minor*, Forsk.,) Lac., I, viii, 1;—*Requin à nageoires noires*, Quoy and Gaym., Zool. de Freycin. pl. 43, f. 1;—*Sq. glauque*, Lac., I, ix, 1, which differs from that of Bl.;—*Sq. ciliaris*, Schn., pl. 31, the cilia of which only denotes its extreme juvenility. The *Palasorrah* and the *Sorrakowah*, Russ., XIV and XV, and a large number of new ones to be described in our Icthyology.

Lamna, Cuv.,(1)

Only differs from a true Squalus in the pyramidal snout, under the base of which the nostrils are placed, and in the locality of the branchial openings which are before the pectorals. The species that inhabits the seas of Europe,

Sq. cornubicus, Schn.; Lacep., I, ii, 3(2).(The Porbeagle Shark), has a projecting carina on each side of the tail, and the lobes of its caudal are almost equal. Its size has often caused it to be confounded with the White Shark.(3)

Species with spiracles and an anal.

Galeus, Cuv.,(4)

The general form of the Sharks, but differing in the presence of spiracles. But a single species is known that inhabits the seas of Europe. It is the *Sq. galeus*, L.; Bl., 118, Duham., Sect. IX, pl. xx, f. 1 and 2.(5) The

Mustelus, Cuv.(6)

Resembles the Squali and Galei in form, but in addition to the presence of spiracles as in the latter, the teeth are like small paving stones.

Two species are taken in the seas of Europe, which are confounded under the name of *Sq. mustelus*, L.(7) The

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(1) *Lamna*, one of the Greek names of the *lamia*, which particular word I am prevented from using, as Fabricius has applied it to a genus of insects.

(2) The *lamia*, Rondelet, 399, the *carcharias*, Aldrov., 383 and 388, are nothing more than the *cornubicus*, which attains a very large size, notwithstanding what Bl., Schn., p. 132, says to the contrary. The pretended jaws of the carcharias, given by Aldrov., 382, are also those of the *cornubicus*. It appears to be more common in the Mediterranean than the true Squalus.

(3) Add *Sq. monensis*, Sh., which has a shorter snout and sharper teeth;—*Isurus oxyrhynchus*, Rafin., Caratt., XIII, 1, is very possibly a species of this genus, perhaps the common one disfigured by the stuffer.

(4) *Galeus*, the generic name, in Greek, of the Squali.

(5) It is also the *lamiola*, Rondel., 377, cop. Aldrov., 394 and 393, Salv., 130, I, cop. Will., B, 6. The enormous size sometimes attributed to it, is owing to the fact that the teeth and jaws, represented Lacep., I, vii, 2, and Hérissant, Ac. des Sc., 1794, have been referred to it—they belong, however, to a foreign species, which will be described in our Icthyology.

(6) *Mustelus*, the Latin translation of γαλεος, a generic name for the Squali. N.B. M. Rafin. unites *Scyllium*, *Galeus*, and *Mustelus*, in his genus Galeus.

(7) The *Emissole commune*, Rondel., 375, Salv., 136, f. 2, cop. Will., pl. B, 5, f. 1, and improperly cited as the galeus.

Notidanus, Cuv.(1)

Only differs from Galeus in the absence of the first dorsal.

Sq. griseus, L.; *Sq. vacca*, Schn.; Augustin Scilla, pl. xvii; *Le Griset*.(2) Ash-coloured above, whitish beneath, and very remarkable for its six wide branchial openings, and for its teeth which are triangular above and serrated below; the snout is depressed and rounded like that of the Shark.

Sq. cinereus, Gm. Seven very wide branchial openings; teeth similar to the lower ones of the Griseus; snout pointed like that of the cornubicus.(3) Both these species inhabit the Mediterranean.(4) The

Selache, Cuv.(5)

In addition to the form of the Squali, and the spiracles of the Galei, is furnished with branchial openings that are nearly large enough to encircle the neck, and with small conical and unemarginate teeth.

The common species, *Sq. maximus*, L.; Blainv., Ann. du Mus. tom. XVIII, pl. vi, f. 1 (The Basking Shark), has nothing of the ferocity of the Shark, although it surpasses it in size as well as all other Squali. Individuals have been captured that were more than thirty feet in length. It inhabits the Arctic Seas, but is sometimes driven on the coast of France by the strength of the north-east winds.(6)

Cestracion, Cuv.

The spiracles, anal, and teeth en pavé of the Musteli, with a spine

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The *Emissole tachetée de blanc*, or *lentillat*—Rondel., 376, Bel., 71, cop. Aldrov., 393.

(1) Νωτιδανὸς (dry back), the Athenian name of some Squalus.

(2) The teeth are well figured, but the fish itself very badly. It is the genus HEXANCHUS, Rafin.

(3) It is the genus HEPTRANCHIAS, Rafin., who erroneously states that it has no spiracles.

(4) Messrs Quoy and Gaym. have discovered, in the Indian Ocean, a species of this subgenus which is all spotted with black, and has seven spiracles.

(5) *Selache*, Σελάχη, a Greek name common to all the cartilaginous fishes.

(6) See the anatomy of this fish by M. de Blainville, loc. cit. N.B. The differences observed between the figures and descriptions of Gunner, Dronth., III, ii, 1, of Pennant, Brit. Zool., No. 41, of Home, Phil. Trans., 1809, and of Shaw, Gen. Zool. may be owing to the difficulty that attends all attempts to observe such large fishes, and may not be sufficient to establish species. Nor can I see in what particulars the *Squalus elephas*, Lesueur, Ac. Nat. Sc. Philad., differs from this *maximus*.

before each dorsal as in Spinax; the pointed jaws projecting as much as the snout, with small pointed teeth in the middle, and very broad rhomboidal ones towards the angles, the ensemble of which resembles certain spiral shells.

But a single species is known, the *Sq. Philippi*, Schn., Phil., Voy. pl. 283, and the teeth: Davila, Cat., I, xxii.

Species without an anal but furnished with spiracles.

Spinax, Cuv.

All the characters of a Carcharias, with the addition of spiracles, and distinguished besides by the want of an anal, by several rows of small trenchant teeth, and by a strong spine before each dorsal.

Sq. acanthias, L.; Bl., 85. (The Picked Dog-Fish.) Brown above; whitish beneath. The young, Edw., 288,(1) are spotted with white.

Centrina, Cuv.(2)

The spines, spiracles, and deficiency of the anal as in Spinax; the position of the second dorsal over the ventrals and the shortness of the tail, give it a more clumsy appearance than is presented by any other species. The lower teeth are trenchant and placed in one or two rows; the upper ones are slender, pointed, and arranged in several rows. The skin is very rough.

The species most common on the coast of France is the *Sq. centrina*, L.; Bl. 115.

Scymnus, Cuv.(3)

All the characters of the preceding fishes except the dorsal spines. They also are found on the coast of France.

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(1) Add the *Sagre*, Brouss., (*Sq. spinax*, L.,) Gunner, Dronth., Mem., II, pl. vii;—the *Aiguillat Blainville*, Risso, Ed. II, f. 6. N.B. The Squalus *uyatus*, Rafin., Caratt., pl. xiv, f. 2, does not differ from a Spinax, and is probably the *Squalus spinax*, L. His Dalatias *nocturnus*, Ib., f. 3, is a Spinax whose spiracles escaped his observation. His Etmopterus *aculeatus*, also, appears to me a Spinax drawn from a dried specimen. This author gives it three branchial orifices, but he only allows the same number to the *Squat. angelus*, which most certainly has five.

(2) Κεντρίνη, the Greek name of this fish, from κεντρεῖν, sting. It is the Oxynotus of Rafin.

(3) *Scymnus*, the Greek name of a Scyllium.

The *Leiche* or *Liche*, Brouss., called, through a mistake, *Sq. americanus*.(1)

A species inhabits the arctic seas which is said to be as ferocious and terrible as the White Shark,(2) and the Indian Ocean produces another, remarkable for the smallness of its first dorsal.(3)

A third, the *Sq. écailleux*, Brouss.; *Sq. squamosus*, Lacep., I, x, 3, under the false name of *Sq. liche*, is remarkable for the small raised and crowded scales resembling leaves, that cover its entire skin. Its snout is long and depressed.

We distinguish those species whose first dorsal is over the ventrals, and the second further back.

One of these is completely covered with small spines, the *Squale bouclé*, Lacep., I, iii, 2; *Squalus spinosus*, Bl., Schn.

A second genus may be formed of the

Zygœna, Cuv.—Sphyrna, Raf.

Which to the characters of a Carcharias, adds a form of head of which there is no other example in the animal kingdom. It is horizontally flattened and truncated before, the sides extending transversely in branches, which give it a resemblance to the head of a hammer; the eyes are placed at the extremity of the branches, and the nostrils on their anterior edge.

The most common species of the European seas, *Sq. zygœna*, L.; *Z. malleus*, Valenciennes, Mém. Mus., IX, xi, 1; Parra, 32; Salv., 40; Will., B., 1, is sometimes twelve feet long.(4)

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(1) Because Gmelin has confounded Cape Breton near Bayonne, with another Cape of the same name near Newfoundland. The *Sq. nicéen*, Risso, Ed. I, f. 6, is a bad drawing of the same fish; in Ed. II, f. 4, it is somewhat better. The *Dalatias sparophagus*, Raf., Car., XIII, 2, must also belong to this genus.

(2) It is the pretended *Sq. carcharias*, of Gunner, Dronth., II, x and xi, and of Fab., Groen., 127, and perhaps also that of Bl., 119, although he gives it an anal. This is probably the place for the *Sq. brevipinnis*, Lesueur, Ac. Nat. Sc. Philad., I, 122, which forms the genus Somniosus of that author, who does not, however, describe the teeth.

(3) *Leiche Laborde*, Quoy and Gaym., Zool., Freycin. pl. 44, f. 2.

(4) Add the species represented by Bl., 117, known by its nostrils, which are placed much nearer the middle (*Z. Blochii*, Nob.), Val., Mem. Mus. IX, xi, 2. Its second dorsal is also much nearer the caudal:—the broad-headed species under the name of *pantouflier*, Lacep., I, vii, 3. It is the *pantouflier* of Risso, *Zyg. tudes*, Val., Mem. Mus. IX, xii, 1, *Koma sorra*, Russel, XII, 2:—The true *pantouflier* (*Sq. tiburo*, L., and Val., loc. cit. XII, 2), Marcgr., 181, known by its heart-shaped

Sqatina, Dumer.(1)

Spiracles, but no anal, as in the third division of the Squali, but differing from all of them in the mouth, which is cleft in the end of the snout and not beneath, and in the eyes, which are placed on its dorsal surface and not on the sides. The head is round, the body broad and horizontally flattened, the pectorals large and extending forwards, but separated from the body by a fissure where the branchial orifices are pierced; the two dorsals are behind the ventrals, and the caudal is attached both above and beneath. The

Squat. angelus; *Squalus squatina*, L.; Bl., 116(2) (The Angel-Fish), attains a considerable size in the European seas. Its skin is rough, and the edges of the pectorals are furnished with small spines.

Pristis, Lath.(3)

The Saw-fish forms a fourth genus. To the elongated form of the Squali it unites a body flattened before and branchiæ opening below, as in the Rays; but its peculiar character consists in a very long depressed snout resembling the blade of a sword, armed on each side with stout, bony, trenchant and pointed spines, planted like teeth. This beak, from which these fishes derive their name, is a most powerful weapon, and with it they attack the largest Whales. The true teeth of their jaws resemble small paving stones, like those of a Mustelus.

The common species, *Pristis antiquorum*, Lath.; *Squal. pristis*, L., attains a length of twelve or fifteen feet.

Raia, Lin.(4)

The Rays form a less numerous genus than the Squali. They are recognized by the horizontally flattened body which resembles a

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head. N.B. The tail of Bloch's figure is twisted, whence the error of Schn., p. 131—*Caudæ inferiore lobo longiore.*

(1) 'Ρίνη, in Greek, *Squatina* and *Squalus* in Latin: the ancient names of this fish still used in Greece and Italy.

(2) Add *Squat. aculeata*, Dumer., of the Mediterranean, which has a row of strong spines along the back;—*Squat. Dumerilii*, Lesueur, Ac. Nat. Sc. Philad., I, x, with a granulated skin, &c.

(3) Πρίστις, saw, the Greek name of this fish. Species: *Pristis antiquorum*;—*Pr. pectinatus*;—*Pr. cuspidatus*;—*Pr. microdon*;—*Prist. cirrhatus*. See Lath., Trans. of the Lin. Soc. vol. II, p. 282, pl. 26 and 27;—*Pristis semi-sagittatus*, Shaw., Russel, I, 13.

(4) *Raia*, in Latin, Βατίς and Βάτος, in Greek, are the ancient names of these fishes.

disk, from its union with the extremely broad and fleshy pectorals which are joined to each other before or to the snout, and which extend behind the two sides of the abdomen as far as the base of the ventrals. The scapulæ of these pectorals are articulated with the spine behind the branchiæ. The eyes and spiracles are seated on the dorsal surface, the mouth, nostrils, and orifices of the branchiæ on the opposite one. The dorsal fins are almost always on the tail. The ova are brown, coriaceous, and square, the angles extended into points. We subdivide the genus as follows:

Rhinobatus, Schn.(1)

The Rhinobati connect the Rays with the Squali by their thick fleshy tail, furnished with two very distinct dorsals and a caudal; the rhomboid formed by their snout and their pectorals is acute in front and narrower in proportion than in ordinary Rays. Independently of this they have all the characters of the latter genus; their teeth are crowded and planted in a quincunx order like small flat paving-stones.

Some of them still have the first dorsal on the ventrals.(2)

In others it is much further back.

Such are the Mediterranean species, *R. rhinobatus*, L.; Will., D, 5, f. 1; and that of Brazil, *R. electricus*, Schn., Marcgr. 152, which has been said to participate in the properties of the Torpedo; this however has not been proved.

There is another species, *Rh. granulatus*, the skin of which is granulated.(3) The

Rhina, Schn.

Only differs from Rhinobatus in a short, broad, and rounded snout.(4)

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(1) Ῥινόβατος, which Gaza translates by *Squatino-raia*, is the Greek name of these fishes, which were considered by the ancients as produced from the union of the Ray with the Squatina.

(2) *Rhin. lævis*, Schn. 77, Russel, 10, and *Rh. Djiddensis*, Forsk., 18, which probably form but one species. It is to it must be referred the fig. of the *Rhinobate*, Lacep., V, vi, 3, and that of Duhamel, part II, Sect. IX, pl. xv.

(3) N.B. The *R. thouin*, Lacep., I, 1, 3, is a variety of the common Rhinobatus. The *Raia halavi*, Forsk., also appears to be the same. Add the *Suttivara*, Russ., XI.

(4) *Rhina ancylostomus*, Bl., Schn., 72, to which the editor improperly adds the *Raie chinoise*, Lacep., I, ii, 2, which, as well as can be determined from a Chinese figure, rather approaches the Torpedo.

TORPEDO, Dum.(1)

The tail short, but still tolerably fleshy; disk of the body nearly circular, the anterior border being formed by two productions of the snout which incline side-wise in order to reach the pectorals; the space between these pectorals, head and branchiæ is filled on each side with a singular apparatus formed of little membranous tubes placed close together like a honeycomb, subdivided by horizontal diaphragms into small cells filled with a sort of mucus, and traversed by numerous nerves proceeding from the eighth pair. It is in this apparatus that resides the electric or galvanic power which has rendered the Torpedo so celebrated; violent shocks are experienced by touching it, and it is most probable that the same power is employed to bewilder its prey. The body is smooth, the teeth small and sharp.

Several species are found in the seas of Europe confounded by Linnæus and most of his successors under the name of *Raia torpedo*.(2)

T. narke, Riss.; Bl., 122; Rondel., 358 and 362. (The Ocellated Torpedo.) Number of spots varying from five to one; no fleshy indentations on the edges of the spiracles.

T. galvanii, Riss.; Rondel. 363, 1. (The Galvanic Torpedo.) Seven fleshy indentations round the spiracles; sometimes of a uniform fawn-colour, and sometimes marbled, dotted, or spotted with blackish.

Several others are found in foreign seas.(3)

RAIA, Cuv.

Rays, properly so called, have a rhomboidal disk, a thin tail, furnished above and near its point with two small dorsals, and sometimes with the vestige of a caudal; small, slender, and crowded teeth in quincunx order in the jaws. Many species inhabit the seas of

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(1) *Torpedo*, *νάρχη*, ancient names of these fishes, derived from their benumbing faculty.

(2) The *Torpille vulgaire à cinq taches*. *Torpedo narke*, Riss., Rondel., 358 and 362.

Torpedo unimaculata, Riss., pl. iii, f. 3.

T. marmorata, Id., Ib., f. 4, Rondel., 362.

T. galvanii, Id., Ib., f. 5, Rondel., 363, f. 1.

(3) *Temeree*, Russel, 1;—*Nallatemeree*, Id., 2;—the *Raie chinoise*, Lacep., I, ii, 2. Both of them being the *Raia timlei*, Bl., Schn., 359.

Europe which are not yet well determined. Their flesh though hard is eaten.

R. clavata, L.; the male, Bl., 84, under the name of *rubus*, the female. (The Thornback.) Distinguished by its roughness and the thick, oval, bony tubercles, each of which is furnished with a recurved spine, that are irregularly scattered over its two surfaces. Their number varies greatly.

R. rubus, L.; Lacep., I, v (The Rough Ray), differs from the clavata in the absence of the tubercles. The male of both species, however, has hooked spines on the front and angle of the wings, their posterior edge being similarly furnished in the female. The appendages of the male are very long and complex.(1)

R. batis, L.; *R. oxyrhinchus major*, Rondel., 348. (The Skate.) Superior surface of the body rough, but spineless, with a single row of spines on the tail. It is the largest of all the species, and is sometimes found to weigh upwards of two hundred pounds. It is spotted when young, assuming a more uniform and a paler tint with age.(2)

In some species of Raia individuals have been observed with a recurved membrane on the middle of the disk, resembling a fin. Such, in the *R. aspera*, is the *Raie Cuvier*, Lacep., I, vii, 1. I have seen the same in a *R. batis*. The

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(1) N.B. The *R. batis*, Penn. Brit. Zool., No. 30, is nothing more than this *rubus*, Lacep. The *rubus*, Bl., 84, which is the *R. clavata*, Will., is, if not a species, at least a variety remarkable for the tubercles that are scattered over both surfaces. There is also a variety, *R. oculata aspera*, Rondel., 351, marked with an ocellated spot on each wing.

(2) Add the *R. undulata*, Lacep., IV, xiv, 2, which differ but little, or not at all, from the *mosaïque*, Id., Ib., XVI, 2;—the *R. chardon* (*R. fullonica*, L.), Rondel., 356, figured under the name of *oxyrhinchus*, Bl., 80, and Lacep., I, vi, 1;—the *R. rudula*, Laroche, An. Mus., XIII, 321, is closely allied to it.—The *R. lentillat* (*R. oxyrhinchus*), Rondel., 347, of which the *Raie bordée*, Lacep., V, xx, 2, or the *R. rostellata*, Risso, pl. 1 and 2, *Læviraia*, Salv., 142, is also a closely allied species;—*R. asterias*, Rondel., 350, and Laroche, An. Mus. XIII, pl. xx, f. 1; *R. miraletus*, Rondel., 349;—*R. aspera*, Rond., 356.

No reliance whatever is to be placed upon the synonymes given by Artedi, Linnæus, and Bloch, as they are in a state of complete confusion, a circumstance principally owing to the fact of their employing, as a chief character, the number of rows of spines on the tail, which varies both with the age and sex, and cannot serve to distinguish the species. That of sharp or blunt teeth is likewise not sure.

Trygon, Adans.(1)

Is recognized by the tail armed with a spine notched on both sides, and the small, slender, and crowded teeth arranged in quincunx order. The head, like that of the common Ray, is enveloped by the pectorals, which generally form a very obtuse disk.

The tail of some is slender and barely furnished with a fold in the form of a fin; of this number some have a smooth back. Such is

R. pastinaca, L.; Bl., 82. (The Sting Ray.) Disk, round and smooth; inhabits European seas, where its spine is considered venomous, on account of the dangerous nature of the wounds inflicted by its serrated edges.(2)

The back of others is more or less spinous,(3) or tuberculated.(4)

Some again have a wide membrane on the under surface of the tail, and the species, *R. Sephen.*, Forsk.,(5) whose back, crowded with osseous tubercles, furnishes us with shagreen, is of this number. The rounded body of one of them is even covered with small spines, and the tail with tubercles like those on the *R. clavata*,—*R. Gesneri*,(6) Cuv. Several, however, have a smooth back.(7)

In some again the slightly elongated and thick tail is terminated by a fin.(8)

Finally, in others the extent of the wings renders the body very broad and the tail very short.(9) The

Anacanthus, Ehrenb.

Resembles a Trygon, but the long and slender tail has neither fin nor spine. There is a species in the Red Sea whose back is furnished with a coarser shagreen than that of the Sephen, and with stellated granules.(1)

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(1) Τρύγων, or *Turtur*, ancient names of these fishes.

(2) Add *Tenkée Shindraki*, Russ., I, 5.

(3) The *Raie tuberculée*, Lacep., I, iv, 1, in which the engraver has omitted the caudal spine;—*Raia Sabina*, Lesueur, Ac. Nat. Sc. Phil.

(4) *Isakurrah-Tenkee*, Russ., I, 4.

(5) Add *Wolga-Tenkee*, Russ., I, 3.

(6) They only had the figure of the tail, Gesner, 77.

(7) *R. lymna*, Forsk., p. 17. It is at least a very closely allied species which is figured, but without a spine, under the name of *torpille*, Lacep., I, vi, 1, and perhaps it is also the *P. grabatus*, Geoff., Eg. Poiss., Bl., XXV, i, 1. N.B. The *lymne*, Lacep., I, iv, 2 and 3, is merely a common Trygon;—*R. jamaïcensis*, Cuv., Sloane's Jam., pl. 246, f. 1.

(8) The *Raie croisée*, Lacep., Ann. Mus., IV, lv, 2.

(9) *P. kunsua*, Cuv., *Tenkee kunsu*, Russel, I, 6;—*R. Maclura*, Lesueur, Ac. Nat. Sc. Phil., or *micrura*, Bl., Schn., 360.

MYLIOBATIS, Dumer.(2)

The head projecting beyond the pectorals, which are larger transversely than in other Rays, giving them somewhat the appearance of a bird of prey with outstretched wings, which has caused them to be compared to the Eagle. The jaws are furnished with broad flat teeth, placed like flags in a pavement, and differing in size according to the species; their extremely long and slender tail terminates in a point and is armed, like that of a Trygon, with a strong spine notched on both sides, supporting near its base and before the spine, a small dorsal. Sometimes there are two or more spines.(3)

The snout of some projects in a parabola. Such as

> *R. aquila*, L.; *Aigle de mer*; *Mourine*; *Ratepenade*; *Bœuf*; *Pesce ratto*, &c.; Duham., part II, Sect. IX, pl. x; and the teeth, Juss. Ac. des Sc., 1721, pl. 17.(4) (The Sea Eagle.) The middle plates of its jaws are much wider than they are long, and placed in a single row; the lateral ones, which are regular hexagons, in three rows.(5) It attains a large size and is found in the Mediterranean and the Atlantic.

In others, the RHINOPTERA, Kuhl, the snout is divided into two short lobes, under which are two similar ones.(6)

CHEPALOPTERA, Dum.(7)

The tail slender; the spine, small dorsal, and the pectorals broad, as in Myliobatis; but the teeth are still more tenuous than those of a Trygon and finely serrated. The anterior part of the head is truncated, and the pectorals instead of clasping it have each of their anterior extremities extended into a salient point, which gives the fish the appearance of having horns.

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(1) The *Aiereba*, Marcgr., 175 (*Raia orbicularis*, Bl., Schn.), belongs, perhaps, to this division.

(2) Μυλίοβατος, from μύλη (grindstone), referring to the form of the teeth.

(3) See the tail with five spines, Voy. de Freycin., Zool. 42, f. 3.

(4) N.B. The fig. of Bloch, 81, is not that of the aquila, but of a Trygon with a fin placed before the spine.

(5) Add: *Myl. bovina*, Geoff., Eg. Poiss., pl. xxvi, f. 1;—*R. narinari*, L., Marcgr., 75, and under the name of *aigle*, Lacep., I, vi, 2, and the teeth, Phil. Trans., Vol. XIX, No. 283, p. 673. *Eel tenkee*, Russ., I, 8, found in both hemispheres;—*R. flagellum*, Schn., 73. His *R. nieuhowii*, Will. App., X, *Mookarrah tenkee*, Russ., VII, perhaps only differs from it in the loss of the spine. The teeth are like those of the *aquila*;—*R. Jussieui*, Cuv., has the middle teeth broader than they are long, and in three rows. Jus. Ac. des Sc., 1721, pl. iv, f. 12.

(6) *Myliobatis marginata*, Geoff., Eg., Poiss., pl. xxv, f. 2;—*Raia quadriloba*, Lesueur, Ac. Nat. Sc. Phil.

(7) *Chepaloptera*, winged head, from the projection of the pectorals.

A gigantic species is occasionally captured in the Mediterranean, the *Raia cephaloptera*, Schn.; *Raie giorna*, Lacep. V, xx, 3,(1) with a black back bordered with violet.

FAMILY II.

SUCTORII.—CYCLOSTOMI, Dumer.,

The Suctorii, as regards the skeleton, are the most imperfect of fishes, and even of all vertebrate animals. They have neither pectorals nor ventrals; their elongated body is terminated before by a circular or semicircular fleshy lip, and the cartilaginous ring which supports it results from the soldering of the palatines to the mandibularies. The bodies of all the vertebræ are traversed by a single tendinous cord filled with a mucilaginous substance without strangulations, which reduces them to the condition of cartilaginous rings, scarcely distinct from each other. The annular portion, a little more solid than the rest, is not however cartilaginous throughout the whole of its circle. They have no ordinary ribs; but the small branchial ones, which are hardly perceptible in the Squali and Rays, are here greatly developed and united with each other, forming a kind of cage; while there are no solid branchial arches. The branchiæ, instead of being pectinated as in all other fishes, resemble purses, resulting from the junction of one face of a branchia with the opposing one of its neighbour. The labyrinth of the ear is enclosed by the cranium, and the nostrils open externally by a single orifice, in front of which is a blind cavity.(1) The intestinal canal is straight and thin, with a spiral valve.

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(1) The *Raie fabronienne*, Lacep., II, v, 1, 2, is most probably a mutilated individual of the *giorna*, but the *R. giorna*, Lesueur, Ac. Nat. Sc. Philad., appears to differ from that of the Mediterranean, and may rather be the *Mobular*, Duham., second part, Sect. IX, pl. 17. As to the *R. banksienne*, Lacep., II, v, 3;—*Manatia*, Id., I, vii, 2;—*Diabolus marinus*, Will., App. IX, 3; they unfortunately rest on no authentic foundation. Add the *Cephaloptera massena*, Riss., p. 15;—*Eregoodootenkee*, Russ., I, 9.

PETROMYZON, Lin.(2)

The Lampreys have seven branchial openings on each side; the skin of the tail above and beneath is turned up into a longitudinal crest which supplies the place of a fin, but in which the rays resemble scarcely visible fibres.

PETROMYZON, Dumer.

The maxillary ring of the True Lamprey is armed with strong teeth, and the interior disk of the lip, which is very circular, is furnished with tubercles covered with an extremely hard shell, and similar to teeth. This ring is suspended under a transverse plate which appears to supply the want of intermaxillaries, and on the sides of which vestiges of maxillaries may be observed. There are two longitudinal rows of small teeth on the tongue, which moves backwards and forwards like a piston; by this, that suction is produced which distinguishes this animal. Water reaches the branchiæ from the mouth by a particular membranous canal, placed under the œsophagus and perforated with holes, that may be compared to a trachea. There is a dorsal before the anus and another behind it, which unites with that of the tail. These fishes habitually fix themselves by suction to stones and other solid bodies; they attack the largest fishes in the same way, and are finally enabled to pierce and devour them.

P. marinus, L.; Bl., 77; the teeth better in Lacep. I, i, 2. (The Sea-Lamprey.) Two or three feet in length, marbled with brown on a yellowish ground; first dorsal very distinct from the second; two large approximated teeth on the upper part of the maxillary ring. It ascends the mouths of rivers in the spring, and is highly esteemed.

P. fluvialis, L.; *Pricka; Sept-Oeil*, &c.; Bl., 78, 1. (The River Lamprey.) From a foot to eighteen inches in length; sil-

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(1) Improperly styled a spiracle. With respect to this family in general, see Dumeril, Diss. sur les Poiss., Cyclostomes.

(2) *Lamproye*, *Lampreda*, *Lamprey*, corruptions of *Lampetra*, which is itself modern, and, according to some, derived from *Lambendo, petras*. *Petromyzon* is the Greek translation of the same, by Artedi. It is somewhat singular that so much uncertainty should envelope the ancient name of a fish so much esteemed, and so common in the Mediterranean.

[illegible], blackish and olive on the back; first dorsal very distinct from the second; two large separated teeth on the upper part of the maxillary ring. Inhabits rivers, &c.

P. planeri, Bl.; *Sucet*, &c.; Gesner, 705. (Small River Lamprey.) From eight to ten inches long; teeth and colours of the fluvialis; the two dorsals contiguous or united. Rivers, &c.(1)

MYXINE, Lin.

But a single tooth on the upper part of the maxillary ring, which is altogether membranous; lateral dentations of the tongue strong, and arranged in two rows on each side, so that the jaws of these fishes seem to be lateral like those of Insects or the Nereides, which induced Linnæus to place them in the class of Vermes; the rest of their organization, however, is analogous to that of the Lampreys(2) the tongue also acts like a piston, and the spine of the back is in the form of a cord. The mouth is circular and surrounded with eight cirri; in its upper margin is a spiracle which communicates with its interior. The body is cylindrical, and furnished behind with a fin that surrounds the tail. The intestine is simple and straight, but wide and plaited internally; the liver bilobate. There are no vestiges of eyes. The eggs become large. These singular animals pour out such an abundance of mucus through the pores of their lateral line, that the water of the vases in which they are kept seems to be converted into a jelly. They attack and pierce other fishes like the Lampreys.

They are subdivided according to the external orifices of their branchiæ. In

HEPTATREMUS, Dumer.

There are still seven holes on each side, as in the Lampreys.

But a single species is known, *Gastrobranche dombey*, Lacep., I, xxiii, 1; *Petromyzon cirrhatus*, Forster; Bl., Schn., p. 532; from the South Seas.(3)

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1) N.B. The figure of the *Planeri*, Bl., 78, 3, is a young *fluvialis*. I also think that the *Petrom. sucet*, Lacep., II, i, 3;—*Sept-oeil*, IV, xv, 1;—*Noir*, Ib., 2, are mere varieties of the planeri: but the fig. I, ii, 1, under the name of *Lamproyon*, *Petrom. branchialis*, represents a peculiar species of this genus, and not an Ammocœtes. I see no difference between the *Petrom. argenteus*, Bl., 415, 2, and the *fluvialis*.

(2) See the Memoir of Abildgaart, Trans. Soc. Nat. Berlin, vol. X, p. 193.

(3) See the Memoir of Sir Ev. Home, Phil. Trans., 1815.

GASTROBRANCHUS, Bl.

The intervals of the branchiæ, instead of having separate issues, communicate with a common canal on each side, each of which terminates in a distinct hole situated under the heart, near the first third of the whole length.

> But a single species is known, *Myxine glutinosa*, L.; *Gastrobranchus cæcus*, Bl., 413; the *Glutinous Hag*. From the Arctic Ocean.

AMMOCŒTES, Dumer.

All the parts which should constitute the skeleton, so soft and membranous that they are hardly entitled to the appellation of bone. The general form of these fishes, and external orifices of the branchiæ are similar to those of the Lampreys, but their fleshy lip is semicircular, and only covers the top of the mouth, consequently they cannot attach themselves to bodies like a true Lamprey. They have no teeth, but the opening of their mouth is furnished with a row of small branched cirri. They have no particular trachea, and their branchiæ are supplied with water from the œsophagus as usual. Their dorsals are united with each other and with the caudal, forming a low and sinuous fold. They inhabit the ooze of brooks, and their habits are greatly like those of Worms, which they otherwise so strongly resemble.(1)

> One of them is found in France, the *Petrom. branchialis*, L.; Lamprillion, Civelle, &c. From six to eight inches long, and the size of a large quill; it has been accused of sucking the branchiæ of fishes, possibly from having confounded it with the *Petrom. planeri.* It is used as bait.

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(1) See *Omalius de Halloìs*, Journ. de Phys., May 1808.

N.B. The *Petrom. rouge*, Lacep., II, i, 2, belongs to this genus, and perhaps does not differ materially from the common species quoted.

SECOND GREAT DIVISION OF THE ANIMAL KINGDOM.

ANIMALIA MOLLUSCA(1).

The Mollusca have neither an articulated skeleton nor a vertebral canal. Their nervous system is not united in a spinal marrow, but merely in a certain number of medullary masses dispersed in different points of the body, the chief of which, termed the brain, is situated transversely on the œsophagus, and envelopes it with a nervous collar. Their organs of motion and of the sensations have not the same uniformity as to number and position, as in the Vertebrata, and the irregularity is still more striking in the viscera, particularly as respects the position of the heart and respiratory organs, and even as regards the structure of the latter; for some of them respire elastic air, and others salt or fresh water. Their external organs, however, and those of locomotion, are generally arranged symmetrically on the two sides of an axis(1).

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(1) That portion of the Baron's work which relates to the Mollusca, and with which he commences the third volume of his last edition, is preceded by a few remarks in the shape of a preface. As I have replaced this division, as well as that of the Zoophytes, in their proper situation, it is impossible to give that preface without creating an awkward break in the series. Besides this, it contains but little of moment. The author merely states the reasons which delayed the publication of the third volume for a long time after the appearance of the fourth; among the most prominent of which were the number of changes in the genera, and in the distribution of species, he was compelled to make by recent discoveries. He also acknowledges his obligations to the works of the late lamented M. de Lamarck, and those of MM. de Blainville, Savigny, Ferrussac, Des Hayes, D'Orbigny, Rudolphi, Bremser, Otto, Leuckart, Chamisso, Eisenhardt, Rang, Sowerby, Charles Desmoulins, Quoy and Gaymard, Delle Chiaje, Defrance, Deslonchamp, Audouin, Milne Edwards, Dugès, Moquin Tandon, Morren, Ranzani, and other savans whom he names in different places. He concludes by regretting that he had not received in time certain very recent works, which would have supplied him with valuable materials, particularly the *Syst. Acaleph.*, Berlin, 1829, 4to, of M. Eschholtz, and the article *Zoophytes* of the Dict. des Sc. Nat., of M. de Blainville, which was not then published. *Am. Ed.*

The circulation of the Mollusca is always double; that is, their pulmonary circulation describes a separate and distinct circle. This function is at least always aided by a fleshy ventricle, situated between the veins of the lungs and the arteries of the body, and not as in Fishes between the veins of the body and the arteries of the lungs. It is then an aortic ventricle. The Cephalopoda alone are provided besides with a pulmonary ventricle, which is even divided into two. The aortic ventricle is also divided in some genera, as in *Arca* and *Lingula*; at others, as in other bivalves, its auricle only is divided.

When there is more than one ventricle they are not joined in a single mass, as in the warm-blooded animals, but are frequently placed at a considerable distance from each other, and in this case the animal may be said to have several hearts.

The blood of the Mollusca is white or bluish, and it appears to contain a smaller proportionate quantity of fibrine than that of the Vertebrata. There are reasons for believing that their veins fulfil the functions of absorbent vessels.

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(1) N.B. Linnæus united all invertebrate animals without articulated limbs in a single class, under the name of VERMES, dividing them into five orders: the INTESTINA, embracing some of my *Annelides* and *Intestina;* the MOLLUSCA, comprehending my *Naked Mollusca*, my *Echinodermata*, and part of my *Intestina* and *Zoophytes;* the TESTACEA, comprising my *Mollusca* and *Annelides with shells;* the LYTHOPHYTA, or Stony Corals; and the ZOOPHYTES, embracing the remainder of the *Polypi*, some of the *Intestina* and the *Infusoria*.

No regard whatever was paid to nature in this arrangement, and Brugière, Encycl. Method., endeavoured to rectify it. He there established six orders of worms, viz. the INFUSORIA; the INTESTINA, including the Annelides; the MOLLUSCA, uniting several of my Zoophytes to my true Mollusca; the ECHINODERMATA, which only comprised Echinus and Asterias; the TESTACEA, nearly the same as those of Linnæus; and the ZOOPHYTES, under which name he included the Corals only. This arrangement was merely superior to that of Linnæus in the more complete approximation of the Annelides, and by the distinction it effected of a part of the Echinodermata.

I proposed a new arrangement of all the invertebrate animals, founded on their internal structure, in a paper read before the Societé d'Histoire Naturelle on the 10th of May 1795, of which my subsequent labours on this part of natural history are the development.

Their muscles are attached to various points of their skin, forming tissues there which are more or less complex and dense. Their motions consist of various contractions which produce inflexions and prolongations of their different parts, or a relaxation of the same, by means of which they creep, swim, and seize upon various objects, just as the form of these parts may permit; but as the limbs are not supported by articulated and solid levers, they cannot advance rapidly, or per saltum.

The irritability of most of them is extremely great, and remains for a long time after they are divided. Their skin is naked, very sensible, and usually covered with a humour that oozes from its pores; no particular organ of smell has ever been detected in them, although they enjoy that sense; it may possibly reside in the entire skin, for it greatly resembles a pituitary membrane. All the Acalepha, Brachiopoda, Cirrhopoda, and part of the Gasteropoda and Pteropoda, are deprived of eyes; the Cephalopoda on the contrary have them at least as complicated as those of the warm-blooded animals. They are the only ones in which the organ of hearing has been discovered, and whose brain is enclosed within a particular cartilaginous box.

Nearly all the Mollusca have a development of the skin which covers their body, and which bears more or less resemblance to a *mantle;* it is often however narrowed into a simple disk, formed into a pipe, hollowed into a sac, or extended and divided in the form of fins.

The *Naked Mollusca* are those in which the mantle is simply membranous or fleshy; most frequently however one or several laminæ, of a substance more or less hard, is formed in its thickness, deposited in layers, and increasing in extent as well as in thickness, because the recent layers always overlap the old ones.

When this substance remains concealed in the thickness of the mantle, it is still customary to style the animals Naked

Mollusca. Most generally, however, it becomes so much developed, that the contracted animal finds shelter beneath it; it is then termed a *shell*, and the animal is said to be *testaceous*; the epidermis which covers it is thin, and sometimes desiccated(1).

The variety in the form, colour, surface, substance and brilliancy of shells, is infinite; most of them are calcareous; some are horny, but they always consist of matters deposited in layers, or exuded from the skin under the epidermis like the mucous covering, nails, hairs, horns, scales, and even teeth. The tissue of shells differs according to the mode of this deposition, which is either in parallel laminæ or in crowded vertical filaments.

All the modes of mastication and deglutition are visible in the Mollusca; here the stomachs are simple, there multiple, and frequently provided with a peculiar armature; their intestines are variously prolonged. They most generally have salivary glands, and always a large liver, but neither pancreas nor mesentery: several have secretions which are peculiar to them.

They also present examples of all the modes of generation. Several of them possess the faculty of self-impregnation; others, although hermaphrodites, require a reciprocal coitus, while in many the sexes are separated. The first are viviparous, and the others oviparous; the eggs of the latter are sometimes enveloped with a harder or softer shell, and sometimes with a simple viscosity.

These varieties of the digestive and generative processes are found in the same order, and sometimes in the same family.

The Mollusca in general appear to be animals that are but slightly developed, possessed of but little industry, and which are only preserved by their fecundity and vital tenacity(1).

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(1) Until my labours on the subject were made public, the *Testacea* constituted a particular order; but there are so many insensible transitions from the naked Mollusca to the Testacea, and their natural divisions form such groups with each other, that this distinction can no longer exist. Besides this, there are several of the Testacea which are not Mollusca.

Division of the Mollusca into Six Classes(1).

The general form of the body of the Mollusca, being in proportion to the complication of their internal organization, indicates their natural division(2).

The body of some resembles a sac open in front, containing the branchiæ, whence issues a well developed head crowned with long and strong fleshy productions, by means of which they crawl, and seize various objects. These we term the CEPHALOPODA.

That of others is closed; the appendages of the head are either wanting or are extremely reduced; the principal organs of locomotion are two wings or membranous fins, situated on the sides of the neck, and which frequently support the branchial tissue. They constitute the PTEROPODA.

Others again crawl by means of a fleshy disk on their belly, sometimes, though rarely, compressed into a fin, and have almost always a distinct head before. We call these the GASTEROPODA.

A fourth class is composed of those where the mouth remains hidden in the bottom of the mantle, which also encloses the branchiæ and viscera, and is open either throughout its length, at both ends, or at one extremity only. Such are our ACEPHALA.

A fifth comprises those, which, also inclosed in a mantle and without an apparent head, have fleshy or membranous arms, furnished with cilia of the same nature. We term these BRACHIOPODA.

Finally, there are some, which, although similar to the other Mollusca in the mantle, branchiæ, &c., differ from them in numerous horny and articulated limbs, and in a nervous system more nearly allied to that of the Articulata. They will constitute our last class, or that of the CIRRHOPODA.

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(1) M. de Blainville has substituted the name of *Malacozoaires* for that of *Mollusca*, separating from them the *Chitons* and *Cirrhipoda*, which he calls *Malentozoaires*.

(2) The whole of this arrangement of the Mollusca, and most of the secondary subdivisions, belong exclusively to me.

CLASS I.

CEPHALOPODA(1).

Their mantle unites under the body, forming a muscular sac which envelopes all the viscera. In several, its sides are extended into fleshy fins. The head projects from the opening of the sac; it is rounded, furnished with two large eyes, and crowned with longer or shorter conical and fleshy arms or feet, capable of being flexed in every direction, and extremely vigorous, the surface of which is armed with suckers or *cups*, which enable them to adhere with great tenacity to every body they embrace. These feet are their instruments of prehension, natation, and walking. They swim with the head backwards, and crawl in all directions with the head beneath and the body above.

A fleshy funnel placed at the opening of the sac, before the neck, affords a passage to the excretions.

The Cephalopoda have two branchiæ within the sac, one on each side, resembling a highly complicated fern leaf; the great vena cava, having arrived between them, divides into two branches, which pour their contents into two fleshy ventricles, each of which is placed at the base of the branchiæ on its own side, and propels the blood into it.

The two branchial veins communicate with a third ventricle, situated near the bottom of the sac, which, by means of various arteries, distributes the blood to every part of the body.

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(1) M. de Blainville has changed this name to that of *Cephalophora.*

M. de Lamarck at first united my *Cephalopoda* and *Gasteropoda* under the common name of *Cephala*, but having subsequently increased the number of classes, he resumed that of *Cephalopoda*.

Respiration is effected by the water which flows into the sac and issues through the funnel. It appears that it can even penetrate into two cavities of the peritoneum, traversed by the vena cava in their passage to the branchiæ, and act upon the venous blood by means of a glandular apparatus attached to those veins.

Between the base of the feet we find the mouth armed with two stout horny jaws resembling the beak of a parrot.

Between the jaws is a tongue bristling with horny points; the œsophagus swells into a crop, and then communicates with a gizzard as fleshy as that of a Bird, to which succeeds a third membranous and spiral stomach, which receives the bile from the two ducts of the very large liver. The intestine is simple and short. The rectum terminates in the funnel.

These animals are remarkable for a peculiar and intensely black excretion, with which they darken the surrounding water when they wish to conceal themselves. It is produced by a gland, and held in reserve by a sac, variously situated, according to the species.

Their brain, which is contained in a cartilaginous cavity of the head, gives off a cord on each side which produces a large ganglion in each orbit, whence are derived innumerable optic filaments; the eye consists of several membranes, and is covered by the skin which becomes diaphanous in that particular spot, sometimes forming folds which supply the want of eyelids. The ear is merely a slight cavity, on each side near the brain, without semicircular canals or an external Meatus, where a membranous sac is suspended which contains a little stone.

The skin of these animals, of the Octopi particularly, changes colour in places, by spots, with a rapidity which greatly surpasses that of the Chameleon(1).

The sexes are separated. The ovary of the female is in the bottom of the sac; two oviducts take up the ova and pass them out through two large glands which envelope them in a viscid matter, and collect them into clusters. The testis of the male, placed like the ovary, communicates with a vas deferens which terminates in a fleshy penis, situated on the left of the anus. A bladder and prostate terminate there likewise. There is reason to believe that fecundation is effected by sprinkling, as is the case with most Fishes. In the spawning season the bladder contains a multitude of little filiform bodies, which, by means of a peculiar mechanism, are ruptured the moment they reach the water, where they move about with great rapidity, and diffuse a humour with which they are filled.

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(1) See Carus, Nov. Act. Nat. Cur., XII, part I, p. 320, and Sangiovanni, Ann. des Sc. Nat. XVI, p. 308.

These animals are voracious and cruel; possessed both of agility and numerous modes of seizing their prey, they destroy immense quantities of Fish and Crustacea. Their flesh is eaten; their *ink* is employed in painting, and the Indian, or China ink is supposed to be made from it(1).

The Cephalopoda comprise but a single order, which is divided into genera, according to the nature of the shell.

Those which have no external shell, according to Linnæus, formed but the single genus,

SEPIA, Lin.(2)

Which is now divided as follows:

OCTOPUS, Lam.—*Polypus* of the ancients.

But two small conical granules of a horny substance, on the two sides, of the thickness of the back; the sac, having no fins, resembles an oval purse; eight feet, all of which are about equal, very large in proportion to the body, and united at base by a membrane; they are employed by the animal in swimming, crawling, and seizing its prey. The length and strength of these limbs render them fearful weapons, which it twines round animals; in this way it has even destroyed men while bathing. The eyes are small in proportion, and the skin contracts over them so tightly as to cover them entirely at the will of the animal. The receptacle of the ink is seated in the liver; the glands of the oviducts are small. Some of them

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(1) M. Ab. Rémusat, however, can find nothing in the authors of China which confirms this idea.

(2) M. de Blainville makes an order of them, which he calls the CRYPTODIBRANCHIATA.

Polypus, Aristotle,

Have two alternate rows of cups along each foot.

The common species, *Sepia octopodia*, Lin., with a slightly rough skin, arms six times the length of its body, and furnished with one hundred and twenty pairs of cups, infests the coast of Europe in summer and destroys immense numbers of Fishes and Crustacea.

The seas of hot climates produce another, *Sepia rugosa*, Bosc.; Seb., III, ii, 2, 3, whose body is rougher; arms somewhat longer than the body, and furnished with ninety pairs of cups. It is from this species that some authors suppose the Indian Ink is procured. Others again,

Eledon, Aristotle,

Have but a single row of cups along each foot.

One of them, the *Poulpe musqué*, Lam., Mém. de la Soc. d'Hist. Nat. 4to, pl. ii; Rondelet, 516(1), is found in the Mediterranean, which is remarkable for its musky odour.

Argonauta, Lin.

Octopi with two rows of cups, the pair of feet which are nearest to the back being dilated at the extremity into a broad membrane. The two cartilaginous granules of the common Octopus are wanting, but these Mollusca are always found in a very thin shell, symmetrically fluted and spirally convoluted, the last whorl so large that it bears some resemblance to a galley of which the spine is the poop. The animal makes a consequent use of it, and in calm weather whole fleets of them may be observed navigating the surface of the ocean, employing six of their tentacula as oars, and elevating the two membranous ones by way of a sail. If the sea becomes rough, or they perceive any danger, the Argonaut withdraws all its arms, concentrates itself in its shell, and descends to the bottom. The body of the animal does not penetrate to the bottom of the spires of the shell, and it appears that it does not adhere to it, at least, there is no muscular attachment, a circumstance which has induced some authors to believe, that its residence there is that of a parasite(1), like the *Pagurus Bernhardus*, for instance. As it is always found in the same shell, however, and as no other animal is ever seen there(2), although it is very common and so formed as to show itself frequently on the surface, and as the germ of it is visible even in the ovum of the Argonaut(3), this opinion must be considered as highly problematical, to say nothing more of it.

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(1) Add the *Poulpe cirrheux*, Lam., loc. cit., pl. i, f. 2, and, in general, several new species of the whole genus Sepia, which will shortly be published by M. de Férussac.

The ancients were well acquainted with this singular animal and its manœuvres. It is their *Nautilus* and their *Pompilus*, Pliny, IX, c. xxix.

Several species are known, closely resembling each other both in the animal and the shell, which were united by Linnæus under the name of *Argonauta argo*, or the *Paper Nautilus*(4).

BELLOROPHON, Montf.

Certain fossil shells, so called, the animal of which is supposed to have been analogous to the Argonauts. They are spirally and symmetrically convoluted, without septa, but thick, and not fluted; the last whorl proportionably shorter(5).

LOLIGO, Lam.

An ensiform lamina of horn in the back in lieu of a shell; the sac has two fins, and besides the eight feet promiscuously loaded with little cups on short pedicles, the head is furnished with two much longer arms, provided with cups near the end only, which is widened. The animal uses these latter to keep itself immovable, as if at anchor. The receptacle of the colouring matter is lodged in the liver, and the glands of the oviducts are very large. The coalescing eggs are deposited in narrow garlands, and in two rows.

They are now subdivided according to the number and armature of the feet and the form of the fins.

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(1) It is upon this hypothesis that M. Rafin. and others have formed the animal into the genus OCYTHOE.

(2) All that has been stated to the contrary, even in modern times, is founded upon report and conjecture.

(3) Poli, Test. Napol., III, p. 10. See, also, Férussac, Mem. de la Soc. d'Hist. Nat., II, p. 160, and Ranzani, Mem. di Stor. Nat. dec., I, p. 85.

(4) *Arg. argo*, Favanne, VII, A, 2, A, 3;—*Arg. haustrum*, Delw., Ib., A, 5;—*A. tuberculata*, Shaw, Nat. Misc., 995;—*A. navicula*, Solander, Fav., VII, A, 7;—*A. hians*, Sol., Fav., VII, A, 6;—*A. Cranchii*, Leach, Phil. Trans., 1817.

(5) *Bellorophon vasulites*, Montf., Conch. Syst., I, p. 51. See, also, Defrance, Ann. des Sc. Nat., I, p. 264.

LOLIGOPSIS, Lam.

Or the *Calmarets*, should have but eight feet as in Octopus; they are only known, however, by drawings of but little authority(1).

In the true Loligo the long arms are furnished with cups like the other tentacula, and the fins are placed near the point of the sac. Three species are found in the European seas.

L. vulgaris; Sepia loligo, L.; Rondel., 506; Salv. 169. Fins forming a rhomb at the bottom of the sac.

L. sagittata, Lam.; Seb., III, iv. Fins forming a triangle at the bottom of the sac; arms shorter than the body, and loaded with cups for about half their length.

L. media; Sep. media, L.; Rondel, 508. Fins forming an ellipsis at the bottom of the sac, which terminates in a sharp point(2).

ONYKIA, Lesueur.—ONYCHOTHEUTHIS, Lichtenst.

The long arms furnished with cups terminating in hooks; in other respects the form is the same(3).

SEPIOLA, Cuv.

The rounded fins attached to the sides of the sac and not to its point. One species,

S. vulgaris; S. sepiola, L.; Rondel., 519, inhabits European seas. The sac is short and obtuse, and the fins small and circular. It seldom exceeds three inches in length, and its horny lamina is as slender and sharp as a stilet.

CHONDROSEPIA, Leukard.—SEPIOTHEUTES, Blainv.

The whole margin of the sac, on each side, bordered with the fins, as in Sepia; but the shell horny, as in Loligo(4).

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(1) See, however, *Leachia cyclura*, Lesueur, Ac. Nat. Sc. Phil., II, p. 89, and Krusenstern, Atlas, pl. lxxxviii.

(2) Add, *Lol. Bartramii*, Lesueur, Ac. Nat. Sc. Phil., II, vii, 1, 2;—*Lol. Bartlingii*, Id., XCV;—*Lol. illecebrosa*, Id., pl. F, No. 6;—*L. pelagica*, Bosc., Vers., I, 1, 2;—*L. Pealii*, Lesueur, l, c, viii, 1, 2;—*L. pavo*, Id., XCVI;—*L. brevipinna*, Id., Ib., III, x.

(3) *On. caribæa*, Lesueur, Ac. Nat. Sc. Phil., II, ix, 1, 2;—*On. angulata*, Id., Ib., I, 3;—*On. uncinata*, Quoy and Gaym., Voy. Freycin., Zool., pl. vii, f. 66;—*On. Bergii*, Licht., Isis, 1818, pl. xix;—*On. Fabricii*, Ib., Id.;—*On. Banksii*, Leach, App. Tuckey, pl. xviii, f. 2, copied Journ. de Phys., tome LXXXVI, June, f. 4;—*On. Smithii*, Leach, Ib. f. 3, Journ. de Phys., Ib., 5.

(4) *Chondrosepia loligiformis*, Leukard, App. Ruppel., pl. vi, f. 1.

SEPIA, Lam.

The Sepiæ, properly so called, have the two long arms of a Loligo, and a fleshy fin extending along the whole length of each side of the sac. The shell is oval, thick, convex, and composed of numerous and parallel calcareous laminæ, united by thousands of little hollow columns, running perpendicularly from one to the other. This structure rendering it friable, causes it to be employed for polishing various kinds of work; it is also given to birds in aviaries, for the purpose of whetting their beaks.

The ink-pouch of the Sepiæ is detached from the liver and situated more deeply in the abdomen. The glands of the oviducts are enormous. The eggs are produced attached to each other in branching clusters resembling those of grapes, and are commonly termed sea-grapes.

The species most commonly found in the seas of Europe, *Sepia officinalis*, L.; Rondel., 498, Seb., III, iii, attains the length of a foot and more. Its skin is smooth, whitish, and dotted with red.

The Indian Ocean produces another, *Sepia tuberculata*, Lam. Soc. d'Hist. Nat., 4to, pl. i, f. 1(1).

NAUTILUS, Lin.

In this genus Linnæus united all spiral, symmetrical and chambered shells, that is to say such as are divided by septa into several cavities; their inhabitants he supposed to be Cephalopoda. One of them, in fact, belongs to a Cephalopode that strongly resembles a Sepia, but it has shorter arms—it forms the genus,

SPIRULA, Lam.

In the hind part of the body, which is that of a Sepia, is an interior shell, which, although very different from the bone of that animal as to figure, differs but little in its formation. A correct idea of the latter may be obtained by imagining the successive laminæ, instead of remaining parallel and approximated, to be concave towards the body, more distant, increasing but little in breadth, and forming an angle between them, thus producing an elongated cone, spirally convoluted in one plane and divided transversely into chambers. Such is the shell of the Spirula, which has additional characters consisting of a single hollow column that occupies the internal side of each chamber, continuing its tube with those of the other chambers to the very extremity of the shell—this column is termed the *siphon*. The turns of the spire do not come into contact.

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(1) Small bodies, armed with a spine, are frequently found among Fossils—they are the extremities of the bones of Sepiæ. They constitute the genus BELOPTERA, Deshayes. See my note on this subject, Ann. des Sc. Nat. II, xx, 1, 2.

There are some other—but petrified—Fossils, which appear to be closely allied to the above bones. They are the RYNCHOLITHES of M. Faure Biguet. See Gaillardot, Ann. des Sc. Nat., II, 485, and pl. xxii, and of Orbigny, Ib., pl. vi.

But a single species, *Nautilus spirula*, L.; List., 550, 2, is known. The

NAUTILUS, properly so called,

Has a shell which differs from the Spirula in the sudden crossing of the laminæ, and in the last turns of the spire, which not only touch the preceding ones but envelope them. The siphon occupies the centre of each septum.

N. pompilius, L.; List. 551, the most common species; it is very large, formed internally of a beautiful nacre, and covered externally with a white crust varied with fawn-coloured bands or streaks.

The animal, according to Rumph, is partly contained within the last cell, has the sac, eyes, parrot-beak, and funnel of the other Cephalopoda; but its mouth, instead of having their large feet and arms, is surrounded by several circles of numerous small tentacula without cups. A ligament arising from the back traverses the whole siphon and fastens it there(1). It is also probable that the epidermis is extended over the outside of the shell, though we may presume it is very thin over the parts that are coloured.

Individuals are sometimes found,—*Naut. pompilius*, *β*, Gmel.; List., 552; AMMONIE, Montf., 74, in which the last whorl does not envelope and conceal the others, but where all of them, though in contact, are exposed, a circumstance which approximates them to the Ammonites; they so closely resemble the common species, however, in all the rest of the shell, that it is scarcely possible to believe them to be any thing more than a variety of it.

Fossil Nautili are found of a large or moderate size, and much more various, as to form, than those now taken in the ocean(1).

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(1) The figure of Rumphius is absolutely unintelligible, and it is somewhat astonishing, that, of the many naturalists who have visited the Indian Ocean, not one has ever examined or collected this curious animal, which belongs to so common a shell.

Chambered shells are also found among fossils, furnished with simple septa and a siphon, the body of which, at first arcuated or even spirally convoluted, remains straight in the more recent parts; they are the LITUUS of Breyn, in which the whorls are sometimes contiguous(2), and sometimes distinct—the HORTOLES of Montfort.

In others, the ORTHOCERATITES(3), it is altogether straight. It is not improbable that the animal resembled that of the Nautilus or of the Spirula. The

BELEMNITES

Probably belong to this family, but it is impossible to ascertain the fact, as they are only found among fossils; every thing, however, proves them to have been internal shells, thin and double, that is, composed of two cones united at base, the inner one much shorter than the other, and divided into chambers by parallel septa, which are concave on the side next to the base. A siphon extends from the summit of the external cone to that of the internal one, and continues thence, sometimes along the margin of the septa and sometimes through their centre. The interval between the two testaceous cones is filled with a solid substance here composed of radiating fibres, and there of self-involving conical layers, the base of each being on the margin of one of the septa of the inner cone. In one specimen we only find this hard portion, and in another we also find the nuclei of the chambers of the inner cone, or what are termed the alveoli. Most commonly these nuclei and the chambers themselves have left no other traces than some projecting circles on the inside of the internal cone. In other specimens again we find more or fewer of the nuclei, and still in piles, but detached from the double conical sheath that enveloped them.

Of all fossils the Belemnites are the most abundant, particularly in chalk and compact limestone(4).

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(1) Large species, with a single siphon: the ANGULITE, Mont., f. 1, 6;—the AGANIDE, Id., 50;—the CANTROPE, Id., 46.

(2) *Nautilus lituus*, Gm.;—*Naut. semilituus*, Planc., I, x.

(3) Breyn. de Polythal., pl. iii, iv, v, and vi; and Walch, Petrif. of Knorr., Supp. IV, b, iv, d, iv. See also Sage, Journ. de Phys. an. IX, pl. 1, under the name of Belemnite.

(4) The best works on this singular genus of Fossils, are the *Mémoires sur les Belemnites considérées zoologiquement et géologiquement*, by M. de Blainville, Paris, 4to, 1827; and that of M. J. S. Miller on the same subject in the Geol. Trans., second series, vol. II, part I, London, 1826 See also Sage, Journ. de Phys. an. IX, and

M. de Blainville divides them according to the greater or less depth to which the internal cone or chambered portion penetrates, or as the edges of the external cone have a small fissure or not, or as the external surface is marked on one side by a longitudinal furrow, or by two or more furrows towards the summit, or finally as that surface is smooth and without furrows.

Bodies very similar to Belemnites, but without a cavity and with a rather prominent base, form the genus ACTINOCAMAX of Miller. It is also upon conjectures of a similar nature that reposes the classification of the

AMMONITES, Brug.

Or the Cornua-Ammoni(1), for they no longer exist except among fossils. They are distinguished from the Nautili by their septa, which, instead of being plane or simply concave, are angular and sometimes undulated, but most frequently slashed on the edge like the leaf of an acanthus. The smallness of their last cell seems to indicate that like the Spirula they were internal shells. They are very abundant in the strata of secondary mountains, where they are found varying from the size of a lentil to that of a coach wheel. Their subdivisions are based upon the variation of their volutes and siphons.

The name of AMMONITES, Lam., (SIMPLEGADES, Montf., 82) is particularly restricted to those species in which all the whorls are visible. Their siphon is near the margin(2).

They have lately been divided into the AMMONITES, PLANITES of Haan, where the edge of the septa is foliaceous, and into the CERATITES of Haan, where it is simply angular and undulated.

Those in which the last whorl envelopes all the others form the ORBITULITES, Lam., or the GLOBITES, and GONIATITES of Haan, or the PELAGUSES, Montf., 62, in all of which the siphon is situated as in the preceding ones.

Raspail, Journ. des Sc. d'Observ., second No. To this genus we refer the *Paclite* Montf., I, 318;—the *Thalamule*, 322;—the *Achéloïte*, 358;—the *Cetocine*, 370;—the *Acame*, 374;—the *Belemnite*, 382;—the *Hibolite*, 386;—the *Prorodrague*, 390;—the *Pirgopole*, 394, which are the cases of different species. As to the *Amimone*, Id., 326;—the *Callirhoe*, 362;—the *Chrisaore*, 378, they appear to be mere nuclei or piles of alveoli detached from their cases.

(1) From this resemblance of their volutes to those of a ram's horn.

(2) The various species of Ammonites have long been collected and described, but with less care than those of other shells. We may commence studying them in the article *Ammonite*, Ency. Method. Vers., I, 28, and in that of M. de Roissy, in Sonini's Buffon, Mollusca, V, 16. See also the Monograph of Haan, entitled "*Monographiæ Ammoniteorum et Goniateorum Specimen*," Leid., 1325.

The SCAPHITES, Sowerb., are those in which the whorls are contiguous and in the same plane, the last one excepted, which is detached and reflexed on itself(1).

Some, BACULITES, Lam., are entirely straight without any spiral portion whatever.

Some of them are round(2), and others compressed(3). The last sometimes have a lateral siphon.

The first cells of some of them—the HAMITES, Sowerb., are arcuated.

Finally, those which vary most from the usual form of this family are the TURRILITES, Montf., 118, where the whorls, so far from running in the same plane, suddenly descend, giving to the shell that form of an obelisk which is called *turreted*(4).

It is also thought, and from similar considerations, that we should refer to the Cephalopoda, and consider as internal shells the

CAMERINES, Brug.—NUMMULITES, Lam.

Commonly called *Nummulites, lenticular stones*, &c. which are only found among fossils, and present, externally, a lenticular figure without any apparent opening, and a spiral cavity internally, divided by septa into numerous small chambers, but without a siphon. They constitute the most universally diffused of all fossils, forming, per se, entire chains of calcareous hills and immense bodies of building stone(5).

The most common, and those which attain the greatest size, form a complete disk, and have only a single range of cells in each whorl(6).

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(1) *Sc. obliquus*, Sowerb.; Cuv., Oss. Foss., II, part II, pl. ii, f. 13.

(2) *Baculites vertebralis*, Montf, 342; Fauj., Mont. de St Pierre, pl. xxi.

(3) The *Tiranite*, Montf., 346; Walch., Petrif., Supp., pl. xii, constitutes the genus RHABDITES of Haan, who refers the ICTHYOSARCOLITES of Desmar. to it.

(4) Montf. Journ. de Phys., an VII, pl. i, f. 1. There are some doubts as to the position of the siphon. Perhaps, as M. Audouin observes, what has been taken for it, is the columellar convolution.

(5) The stone termed *pierre de Laon* is wholly formed of Nummulites. The pyramids of Egypt are placed upon rocks of this description, which also furnished the materials of the superstructure. See the Memoir of Fortis on the *Discolites* in his work on Italy, and that of *M. Héricart de Thury*, as well as Lam., *Anim. sans Verteb.*, VIII, and M. D'Orbigny, Tab. Method. des Cephalopodes.

(6) *Nautilus mammilla*, Ficht., and Moll., VI, a, b, c, d;—*Naut. lenticularis*, VI, e, f, g, h, VII, a—h. To this genus also we refer the LICOPHRE and EGEONE, Montf., 158, 166, and his ROTALITE, 162, which differs from the ROTALIES of Lamarck.

Some very small species are also found in certain seas(1).

The margin of other small species, (the SIDEROLITHES, Lam.,) both fossil and living, are bristled with points which give them a stellated appearance(2).

The labours and researches, fruits of an infinite patience, of Bianchi (or Janus Plancus), Soldani, Fichtel, Moll, and D'Orbigny, have ascertained an astonishing number of these chambered shells without a siphon, like the Nummulites, that are extremely small and frequently microscopical, both in the sea, among the sand, fucus, &c. and in a fossil state in the sand formations of various countries. They vary in a remarkable degree as to their general form, the number and relative position of the chambers, &c. In one or two species, the only ones whose animals have been observed, there appears to be a small oblong body crowned by numerous and red tentacula, which, added to the septa of the shell, have caused them to be placed immediately after the Cephalopoda, like the genera just mentioned. This arrangement, however, requires to be confirmed by more numerous observations before we can consider it as final.

Such of these species as were known in the time of Linnæus and Gmelin were placed by those naturalists among the Nautili.

M. D'Orbigny, who has exceeded every other person in attention to this subject, forms them into an order which he calls FORAMINIFERA, on account of the only communication between the cells being by means of holes, and divides them into families according to the manner in which the cells are disposed.

When the cells are simple and spirally arranged, they constitute his HELICOSTEGA, which are again subdivided. If the whorls are enveloped, as is particularly the case in the Nummulites, they become his HELICOSTEGA NAUTILOIDA(3).

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(1) *Nautilus radiatus*, Ficht. and Moll., VII, a, b, c, d;—*Naut. venosus*, Ib., e, f, g, h.

(2) *Siderol. calcitrapoïde*, Lam., Fauj., Mont. de St Pierre, pl. xxxiv.

(3) These infinitely small beings having but little to do with our plan, we will merely cite the names of the genera with a few examples. The *Nummulites* themselves are compressed in this first division under the name of NUMMULINES,—*Nautilus pompiloïdes*, Fich., and Moll., *N. incrassatus*, Id.

The SYDEROLINA, the same as the Sydcrolites, Lam.

CRISTELLARIA.—*Nautilus cassis*, *Naut. galea*, Id., &c.

ROBULINA,—*Nautilus calcar*, *Naut. vortex*, Id.

SPIROLINA,—*Spirolinites cylindracea*, Lam., Anim., sans verteb.

PENEROPLA,—*Nautilus planatus*, Fitch. and Moll., &c.

DENTRITINA,

POLYSTOMELLA,

ANOMALINA,

If the whorls do not envelope each other, they are the Helicostega Ammonoida(1).

If the whorls are elevated as in most Univalves, they are the Helicostega Turbinoida(2).

Simple cells may also be strung upon a single, straight or slightly curved axis, constituting the family of the Stycostega(3).

Or they may be arranged in two alternate series, when they become the Enallostega(4).

Vertebralina,
Cassidulina.

(1) M. D'Orbigny divides them into four genera:
Soldania,
Operculina,
Planorbulina,
Planulina.

(2) These form ten genera:
Truncatulina,
Gyroidina,
Globigerina,
Calcarina, where is placed, among others, the *Nautilus Spengleri*, Fich. and Moll., XIV, d., I, and XV,
Rotalia,
Rosalina,
Valvulina,
Bulimina,
Uvigerina,
Clavulina.

(3) The Stycostega are divided by M. D'Orbigny into eight genera: the Nodosaria, which he subdivides into the true Nodosaria, such as the *Nautilus radicula*, L.;—*Naut. jugosus*, Montag., Test. Brit., XIV, f. 4; and into Dentalina, such as the *Nautilus rectus*, Montag., I, cit., XIX, f. 4, 7 (the genus Reophaga, Montf., I, 330); into Orthocerina, such as the *Nodosaria clavulus*, Lam., Encycl., pl. 466, f. 3; and into Mucronina.

Frondicularia, where comes *Renulina complanata*, Blainv., Malac.
Lingulina,
Rimulina,
Vaginulina, to which belongs the *Nautilus legumen*, Gm., Planc., I, f. 7; Ency., pl. 465, f. 3.
Marginulina, where we find the *Nautilus raphanus*, Gm., Soldan., II, xciv.
Planularia, such as the *Nautilus crepidulus*, Fich., and Moll., XIX, g, h, i.
Pavonina.

(4) M. D'Orbigny has five genera of Enallostegæ:
Bigenerina,
Textularia,
Vulvulina,
Dimorphina,
Polymorphina,

Or a few of them may be collected and united as in a pellet, forming the AGATHISTEGA(1).

Finally, in the ENTOMOSTEGA(2) the cells are not simple as in the other families, but are subdivided by transverse septa in such a way that a section of the shell exhibits a sort of trellis.

VIRGULINA,
SPHEROIDINA.

(1) The *Agathistega* or *Milliola* of authors, which compose immense banks of calcareous stone, in the arrangement of M. D'Orbigny, only form six genera:

BILOCULINA,
SPIROLOCULINA,
TRILOCULINA,
ARTICULINA,
QUINQUELOCULINA,
ADELOSINA.

M. de Blainville assures us that he has ascertained, from observation, that their animal has no tentacula: should this be the case, they are at once greatly removed from the Cephalopoda.

(2) The *Entomostega* resemble, externally, several of the *Helicostega*. M. D'Orb. divides them into five genera;

AMPHISTEGINA,
HETEROSTEGINA,
ORBICULINA,
ALVEOLINA,
FABULARIA.

Those who are desirous of penetrating more deeply into the study of this curious portion of Conchyliology, on which our limits forbid us to expatiate, but which may be useful in the investigation of fossil strata, will find an excellent guide in the Table Method. des Céphalopodes, inserted by M. D'Orbigny in the Ann. des Sc. Nat., 1826, tome VII, p. 95 and 245, and may profit by the large models constructed by this able observer.

CLASS II.

PTEROPODA(1).

The Pteropoda, like the Cephalopoda, swim in the ocean, but being deprived of feet, can neither fix themselves to other bodies, nor crawl. Their organs of locomotion consist of fins placed like wings on the two sides of the mouth. But few and small species are known, all of them hermaphrodites.

Clio, Lin.—Clione, Pall.

Body oblong, membranous, without a mantle; head formed of two rounded lobes, whence originate small tentacula; two small fleshy lips, and a little tongue on the front of the mouth; the fins covered with a vascular net-work which acts as branchiæ, the anus and genital orifice under the right one. Some authors consider them as possessing eyes.

The external envelope is far from being filled with the viscera; the stomach is wide, the intestine short, and the liver voluminous.

Clio borealis, L. This species, which is the most celebrated, is found in astonishing numbers in the arctic seas, furnishing, by its abundance, food for the whales, although each individual is hardly an inch long(2).

Brugière has observed a larger and not less abundant species in the Indian Ocean; it is distinguished by its rose colour, emarginated tail, and the division of the body, by grooves, into six lobes, Encycl. Meth., Pl. of the Mollusc., pl. lxxv, f. 1, 2.

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(1) M. de Blainville unites my *Pteropoda* and my *Gasteropoda* in a single class, which he calls Paracephalophora, of which my *Pteropoda* form a particular order, under the name of Aporobranchiata. This order is divided into two families; the *Thecosoma*, which are furnished with a shell, and the *Gymnosoma* which are not.

(2) The *Clio borealis* of Pallas (Spicil., X, pl. 1, f. 18, 19), the *Clio retusa* of Fabricius (Faun. Groen., L., 334), and the *Clio lamacina* of Phips (Ellis, Zooph., pl. 15, f. 9, 1, 10), of which Gmelin makes as many different species, appear to be this same animal.

CYMBULIA, Peron.

A cartilaginous or gelatinous envelope resembling a galley, or rather a sabot or wooden shoe, bristling with small points disposed in longitudinal rows. The animal has two large wings composed of a vascular tissue, which are its branchiæ and fins; between them, on the open side, is a third and smaller lobe with three points. The mouth with two small tentacula is situated between the wings towards the closed side of the shell and above two small eyes, and the genital aperture, whence issues a small penis in the shape of a little proboscis. It is so diaphanous, that the heart, brain, and viscera can be distinguished through the envelopes(1).

PNEUMODERMON, Cuv.

The Pneumoderma begin to be a little further removed from the Elios.' Their body is oval, without a mantle and without a shell; the branchiæ are attached to the surface and composed of little laminæ arranged in two or three lines so disposed as to form an H on the part opposite to the head. The fins are small; the mouth furnished with two small lips and two bundles of numerous tentacula, each terminated by a sucker, has a little lobe or fleshy tantaculum beneath(2).

Pneumodermon Peronii, Cuv. Ann. du Mus., IV, pl. 59; and Péron, Ib., XV, pl. 2. Not more than an inch long. This species, which is the most common, was captured in the Ocean by Peron.

LIMACINA, Cuv.

The Limacinæ, according to the description of Fabricius, should be closely related to the Pneumoderma; but their body terminates in a spirally convoluted tail, and is lodged in a very thin shell formed by one whorl and a half, umbilicated on one side, and flattened on the other. The animal uses its shell as a boat and its wings as oars, whenever it wishes to navigate the surface of the deep.

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(1) See Péron, Ann. Mus., XV, pl. iii, f. 10—11. N.B. In the fig. of *Cymbulia*, given by Blainville, Malac., XLVI, the position of the animal in the shell is directly the reverse of the true one. Our description is founded upon the recent and repeated observations of M. Laurillard.

(2) M. de Blainville once thought that the fins supported the branchial tissue, and that what I have considered as branchiæ is another kind of fin. In this case the analogy with the Clios would have been greater; but since then, (Malacol., p. 483) that gentleman has adopted my views.

Clio helicina, Phips and Gmel.; *Argonauta arctica*, Fab., Faun. Groenl., 387. Almost as common on the arctic seas as the *Clio borealis*, and is considered as forming the chief source of food for the Whale(1).

HYALEA, Lam.,—CAVOLINA, Abildg.

Two large wings; no tentacula; a mantle cleft on the sides, lodging the branchiæ in the bottom of its fissures, and invested by a shell also cleft laterally, the ventral face of which is arched, and the dorsal flat and longer than the other; the transverse line which unites them behind, furnished with three sharp dentations. When alive, the animal thrusts several appendages, that are more or less long, through the lateral fissures of its shell; they are productions of the mantle.

H. cornea, Lam.; *Anomia tridentata*, Forskahl.; *Cavolina natans*, Abildgaard; Cuv., Ann. du Mus., IV, pl. 59; and Péron, Ib., XV, pl. 3, f. 3. A small, yellowish, semi-diaphanous shell, found in the Mediterranean and the Atlantic Ocean(2).

CLEODORA, Peron.

The Cleodoræ, for which Brown originally created the genus Clio, appear to resemble the Hyaleæ in the simplicity of their wings and in the absence of tentacula between them; it is also probable that their branchiæ are concealed in the mantle; their conical or pyramidal shell, however, is not cleft on the sides. M. Ray distinguishes

CLEODORA, properly so called, with a pyramidal shell,

CRESEIS, with a conical and elongated shell(3),

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(1) I am not sure that the animal drawn by Scoresby, of which de Blainville (Malac., pl. xlviii, bis, f. 5) makes his genus SPIRATELLA, is, as he thinks, the same as those of Phips and Fabricius.

(2) Add: *Hyal. lanceolata*, Lesueur, Bullet., des Sc. June 1813, pl. v, f. 3;—*Hyal. inflexa*, Ib., f. 4.

N.B. The *Glaucus*, *Carinaire*, and *Firole*, referred by Péron to the family of the PTEROPODA, belong to the GASTEROPODA; the *Philliroé* of the same author also probably belongs to it.—His *Callianïre* is a Zoophyte.

(3) It is probably near the Creseis, and perhaps even in the same subgenus, according to Messrs Rang and Audouin, that we must place the genus TRIPTERA of Messrs Quoy and Gaymard, which is referred by M. de Blainville to the family of the Akeræ.

Cuviera, with a cylindrical shell,
Psyche, with a globular shell, and
Eurybia, with a hemispherical shell(1).

Pyrgo.

It is thought that we may approximate to the Hyaleæ, this very small fossil shell discovered by M. Defrance. It is very thin, globular, and divided by a very narrow transverse cleft, except before, where it becomes somewhat widened.

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(1) See the Mém., of M. Rang, Ann. des Sc. Nat., Novemb., 1827, and March 1828.

N.B. Several Pteropoda have been discovered in a fossil state. M. Rang has found, near Bourdeaux, *Hyaleæ*, *Cuvieriæ*, and *Cleodoræ*. See Ann. des Sc. Nat. August 1826. The Vaginella of Daudin is a Cresis according to M. Rang; it has, in fact, all the characters of the latter.

CLASS III.

GASTEROPODA.

The Gasteropoda constitute a very numerous class of the Mollusca, an idea of which is afforded by the Slug.

They generally crawl upon a fleshy disk, situated under the abdomen, which sometimes however assumes the shape of a sulcus, or that of a vertical lamina. The back is furnished with a mantle which is more or less extended, takes various forms, and in the greater number of genera, produces a shell. Their head, placed anteriorly, is more or less visible, as it is the more or less involved under the mantle; its tentacula are very small, situated above the mouth and do not surround it, varying in number from two to six; sometimes they are wanting; their function is that of touch, or at most that of smell. The eyes are very small, here adhering to the head, and there to base, side, or point of the tentaculum; sometimes they are wanting. The position, structure, and nature of their respiratory organs vary, and afford the means of dividing them into several families; they never, however, have more than a single aortic heart, that is to say, one placed between the pulmonary vein and the aorta.

The position of the apertures, through which the genital organs and that of the anus project, varies; they are almost always, however, on the right side of the body.

Several are entirely naked; others have merely a concealed shell, but most of them are furnished with one that is large enough to receive and shelter them.

The shell is formed in the thickness of the mantle. Some of them are symmetrical and consist of a single piece; others are non-symmetrical, which, in those species where they are very concave, and where they continue to grow for a long time, become obliquely spiral.

If we figure to ourselves an oblique cone, in which other cones, always wider in one direction than in the others, are successively placed, it will be easily seen that the convolution of the whole takes place on the side which enlarges the least.

This part, on which the cone is rolled, is termed the *columella;* it is sometimes solid, and sometimes hollow. When hollow, its aperture is called the *umbilicus.*

The *whorls* of the shell may either remain in one plane, or incline towards the base of the columella.

In this last case the preceding whorls rise above each other, forming the *spire,* which is so much the more *acute,* as the whorls descend more rapidly, and the less they increase in width. These shells with a salient spine are said to be *turbinated.*

When, on the contrary, the whorls remain nearly in the same place, and do not envelope each other, the *spine* is *flat,* or even *concave.* These shells are said to be *discoidal.*

When the top of each whorl envelopes the preceding ones, the *spire* is *hidden.*

The part through which the animal appears to come out is named the *aperture.*

When the whorls remain nearly in the same plane, while the animal crawls, its shell is vertical, the columella crosswise on the hind part of its back, and its head passes under the edge of the opening opposite to the columella.

When the spire is salient, it inclines from the right side in almost every species; in a very few only does it project from the left when they are in motion; these are said to be *reversed.*

It is observed that the head is always on the side opposite to that to which the spire is directed. Thus it is usually on the left, and in the *reversed* on the right. The case is reversed with respect to the organs of generation.

The organs of respiration, which are always situated in the last whorl of the shell, receive the ambient element from under its edge, sometimes because the mantle is entirely detached from the body along this edge, and sometimes because it is perforated there.

It sometimes happens that the margin of the mantle is prolonged in a canal, in order to allow the animal to seek the ambient element without protruding its head and foot from its shell. The latter, in this case, has also an emargination or canal in its edge, for the purpose of lodging that of the mantle. The canal, consequently, in ordinary species, is on the left, and in the reversed, on the right.

The animal, however, being very flexible, frequently changes the position of the shell, and most commonly when there is an emargination or canal, it directs the latter forwards, which throws the spine behind, the columella to the left, and the opposite margin to the right. It is the contrary in the reversed, for which reason their shell is said to be contorted to the left.

The aperture of the shell, and consequently the last whorl, are more or less large, in proportion to the other whorls, as the head or foot of the animal, which is constantly protruding from and retracting within them, is more or less voluminous in proportion to the mass of the viscera which remain fixed in the shell.

This aperture is wider or narrower in proportion to the greater or less degree of thickness of these same parts. The aperture of some shells is narrow and long—this is because the foot is thin, and becomes folded in order to enter.

Most of the aquatic Gasteropoda, with a spiral shell, have an *operculum*, a part sometimes horny, sometimes calcareous, attached to the posterior part of the foot, which closes the shell when its occupant is withdrawn into it and folded up.

In some of the Gasteropoda the sexes are separate; others are hermaphrodite; some of the latter possess the faculty of self impregnation, while others require a reciprocal coitus.

Their organs of digestion vary as much as those of respiration.

This class is so numerous that we have been compelled to divide it into a certain number of orders, which we have founded upon the position and form of the branchiæ. The

PULMONEA

Respire the natural air in a cavity, the narrow orifice of which they open and shut at pleasure. Some of them have no shell, others have one which is even frequently turbinated, but the operculum is always wanting. The

NUDIBRANCHIATA

Have no shell, and are furnished with naked branchiæ, of various forms, on some part of their back. The

INFEROBRANCHIATA,

Similar in other respects to the Nudibranchiata, have their branchiæ on the margin of their mantle. The

TECTIBRANCHIATA

Have branchiæ on the back and side, covered by a lamina of the mantle, which generally contains a shell more or less developed, or sometimes only involved in a recurved margin of the foot.

These four orders are hermaphrodites, requiring a reciprocal coitus. The

HETEROPODA

Have their branchiæ on the back, where they form a transverse range of small panaches, protected, as well as part of the viscera, in some species, by a symmetrical shell. They are particularly distinguished however by the foot, which is compressed into a thin, vertical fin, on whose margin is frequently observed a small cup, the only vestige of the horizontal foot of the rest of the class. In the

PECTINIBRANCHIATA

The sexes are separated; the respiratory organs almost always consist of branchiæ, composed of lamellæ, united in the form [illegible], widely open

[illegible] ated shell, a mouth some- [illegible] ith a siphon, and most ge- [illegible] or less perfectly closed by [illegible] of the animal behind(1).

TUBULIBRANCHIATA

Have a shell resembling a more or less irregularly pointed tube, which attaches itself to various bodies. Their branchiæ consist of a single range along the left side of the roof of the branchial cavity. The

SCUTIBRANCHIATA

Have branchiæ similar to those of the Pectinibranchiata; but the sexes are united, so that fecundation takes place without a mutual copulation, as in the Acephala. Their shell is very open, and in several forms a non-turbinated shield; the operculum is always wanting. The

CYCLOBRANCHIATA,

Hermaphrodites like the Scutibranchiata, have a shell composed of one or several pieces, but never turbinated nor with an operculum; their branchiæ are attached under the margin of their mantle, as in the Inferobranchiata.

ORDER I.

PULMONEA(2).

The Pulmonea are distinguished from the other Mollusca by respiring elastic air through a hole opening under the margin of the mantle, and which they dilate and contract at will; they have no branchiæ, but a mere net-work of pulmonary vessels which creep over the parietes of the respiratory cavity and chiefly on its ceiling.

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(1) N.B. Sometimes, as in Vermetus, &c., the foot is recurved in such a manner that the operculum is before.

(2) M. de Blainville prefers the term PULMONOBRANCHIATA.

Some of them are terrestrial; others are aquatic, but are compelled to visit the surface from time to time for the purpose of opening the orifice of their pectoral cavity, or to respire. They are all hermaphrodite. The

PULMONEA TERRESTRIA

Have generally four tentacula; in two or three only, of a very small size, the lower pair are not to be seen.

Those which possess no apparent shell, form in the Linnæan system the genus

LIMAX, Lin.

Which we divide as follows:

LIMAX, Lam.

The body elongated, and the mantle, a dense fleshy disk which is confined to the forepart of the back, merely covering the pulmonary cavity; in several species it contains a small, flat and oblong shell, or at least a calcareous concretion in place of it. The respiratory orifice is on the right of this species of shield, and the anus on the margin of that orifice. The four tentacula are protruded and retracted, evolving themselves like the inverted fingers of a glove, and the head itself can be partly withdrawn under the disk of the mantle. The genital organs open under the upper right tentaculum. The mouth has only an upper jaw, resembling a dentated crescent, which enables these animals to gnaw fruits and herbs, which they do with so much voracity as to effect considerable injury. The stomach is elongated, simple and membranous.

M. de Férussac distinguishes

ARION, Fer.,

Where the respiratory orifice is towards the anterior part of the shield, which merely contains a few calcareous granules. Such is

Limax rufus, L.; Férussac, Moll. Terr. et Fluv., pl. i and iii.

It is everywhere to be met with in wet weather, and is sometimes entirely black, Ib. II, i, 2. A decoction of this species is sometimes used in France for pulmonary disorders(1).

Lima, Féruss.

The respiratory opening towards the posterior part of their shell, and frequently much larger. Such is

L. antiquorum, Féruss., pl. iv and viii, A, f. 1; *L. maximus*, L.; *L. sylvaticus*, Drap., Moll., IX, x. Frequently spotted or streaked with grey; found in caves and dark forests.

L. agrestis, L.; Féruss., pl. v, f. 5—10, Small, immaculate; very common and extremely noxious(2).

Vaginulus, Féruss.

A dense mantle without shell, stretching over the whole length of the body; four tentacula, the lower ones slightly forked; the anus at the extreme posterior extremity, between the point of the mantle and that of the foot, the same orifice leading to the pulmonary cavity situated along the right flank; orifice of the male organ of generation under the right inferior tentaculum, and that of the female under the middle of the right side. These organs, as well as those of digestion, are very similar to the same parts in the Slug.

These Mollusca are found in both Indies, and closely resemble the common Limaces(3).

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(1) Add: the *L. albus*, Müll., Féruss., pl. i, f. 3;—*L. hortensis*, Id., pl. ii, f. 4—6.

(2) Add: *L. alpinus*, Féruss., pl. v, a;—*L. gagates*, Drap., pl. ix, f. 1 and 2, &c. N.B. The Plectrophora, Féruss., would be Limaces, having a sort of small conical shell on the end of their tail, and far from the shield; they are only known, however, by drawings of very equivocal authority, Favanne, Zoomorphose, pl. lxxvi, copied Féruss., pl. vi, f. 5, 6, 7.

M. de Blainville (Malac., p. 464) now doubts the reality of his genus Limacella, and rejects his genus Veronicella, Dict. des Sc. Nat. The Phylomycus and Eumelus, Raf., are too imperfectly indicated to be admitted into a work like this.

(3) *Vaginulus Taunaisii*, Féruss., pl. viii, A, f. 7; and viii, B, 2, 3;—*V. altus*, Id., pl. viii, A, f. 8, and viii, B, f. 6;—*V. Langsdorfii*, Id., pl. viii, B, f. 3 and 4;—*V. lævigatus*, Id., pl. viii, B, f. 5, 7;—*Onchidium occidentale*, Guilding, Lin. Trans. XIV, ix.

The genus Meghimatium of Van Hassel., Bullet. Univers., 1824, Zool. tome III, p. 82, should apparently be added to it.

N.B. The genus Vaginula differs from Onchidium, with which M. de Blainville has united it, Malac., p. 465, detaching from it, at the same time, the true Onchidiums to form his genus Peronia. His anatomy of the Vaginula in the Moll. Terr. et Fluv. of M. de Férussac, pl. viii, C, is very good.

TESTACELLA, Lam.

The respiratory orifice and the anus at the posterior extremity; the mantle very small, and placed on the same part; it contains a small oval shell with an extremely wide aperture and a very small spine, which is not one tenth of the length of the body; otherwise these animals resemble the Limaces.

Test. haliotoidea, Drap.; Cuv., Ann. du Mus., V, xxvi, 6, 11. A common species in the southern departments of France; it lives under ground, and feeds chiefly on Lumbrici. M. de Férussac has observed that when accidentally placed in too dry a situation, the mantle experiences a singular development, and furnishes it with a sort of shelter.

PARMACELLA, Cuv.

A membranous mantle with loose margins placed on the middle of the back, and containing in its posterior portion an oblong, flat shell, the hind part of which exhibits a slight indication of a spine; the respiratory orifice and the anus, under the right side of the middle of the mantle.

Parm. Olivieri, Cuv., Ann. du Mus., V, xxix, 12—15. The first species known; from Mesopotamia.

Parm. palliolum, Feruss., pl. vii, A. Inhabits Brazil. Some others are found in India.

In the terrestrial Pulmonea with complete and apparent shells, the edges of the aperture in the adult are usually tumid.

HELIX, Lin.

To this genus Linnæus referred all those species in which the aperture of the shell, somewhat encroached upon by the projection of the penultimate whorl, assumes a crescent-like figure.

When this crescent of the aperture is as wide as it is high, or wider, it becomes the

HELIX, Brug. and Lam.

Some of them have a globular shell.

Of this number is the *Helix pomatia*, L., common in the gardens and vineyards of France, with a reddish shell marked with paler bands, an animal which in some places is considered a delicious article of food. The *Hel. nemoralis*, L., is another; whose shell is variously and vividly coloured; in wet seasons it is very injurious to espaliers(1). There are but few persons who have not heard of the curious facts respecting the reproduction of their amputated parts(2).

In others the shell is depressed, that is, the spire is flattened(3). Some of these have ribs projecting internally(4), and there are others in which the last whorl is suddenly recurved, (in the adult,) assuming an irregular and plaited form(5).

VITRINA, Drap.—HELICO-LIMAX, Féruss.

The Vitrinæ are Helices with a very thin flattened shell, without an umbilicus; the aperture large, but its margin not tumid; the body too large to be completely drawn into the shell; the mantle has a double border(6), the upper one, which is divided into several lobes, extends considerably beyond the shell, and is reflected over it.

The known European species inhabit wet places, and are very small(7). Hot climates produce larger ones.

There are some species of Helix, in which the body can hardly enter the shell, although not furnished with this double border, which should be approximated to them(8).

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(1) Add the *Hel. glauca,—H. citrina;—H. rapa;—H. castanea;—H. globulus;—H. lactea;—H. arbustorum;—H. fulva;—H. epistylium;—H. cincta;—H. ligata;—H. aspersa;—H. extensa;—H. nemorensis;—H. fruticum;—H. lucena;—H. vittata;—H. rosacea;—H. italia;—H. lusitanica;—H. aculeata;—H. turturum;—H. cretacea;—H. fuscescens;—H. terrestris;—H. nivea;—H. hortensis;—H. lucorum;—H. grisea;—H. hæmastoma;—H. pulla;—H. venusta;—H. picta*, Gmel. &c.

(2) See Spallanzani, Schæffer, Bonnet, &c.

(3) *Hel. lapicida;—H. cicatricosa;—H. ægophtalmus;—H. oculus capri;—H. albella;—H. maculata;—H. algira;—H. lævipes;—H. vermiculata;—H. exilis;—H. caracolla;—H. cornu militare;—H. pellis serpentis;—H. Gualteriana;—H. oculus communis;—H. marginella;—H. maculosa;—H. nævia;—H. corrugata;—H. ericetorum;—H. nitens;—H. costata;—H. pulchella;—H. cellaria;—H. obvoluta;—H. strigosula;—H. radiata;—H. crystallina;—H. ungulina;—H. volvulus;—H. involvulus;—H. badia;—H. cornu venatorium*, &c.

(4) *Hel. sinuata;—H. lucerna;—H. lychnuchus;—H. cepa;—H. isognomostoma;—H. sinuosa;—H punctata*, &c.

(5) *Hel. ringens*, Chemn., IX, cix, 919, 920, the AXOSTOMA of Lam., or TOMOGERES, Montf.; an analogous fossil shell is the STROPHOSTOMA, Deshayes. See, also, pl. v, vi, vii, viii, of Draparn., with the accompanying descriptions; the works of Sturm and Pfeiffer on the German species, but particularly see the splendid folio of M. de Ferussac on the "Mollusques terrestres et fluviatiles."

(6) Termed by M. de Férussac "*une cuirasse et un collier.*"

(7) *Hel. pellucida*, Mull. and Geoff.; *Vitrina pellucida*, Drap., VIII, 34—37:—the *Helicarion*, Quoy and Gaym., Zool. de Freycin., pl. lxvii, 1; Féruss., pl. ix, f. 1—4.

(8) *Hel. rufa* and *brevipes*, Féruss., Drap., VIII, 26—33.

When the crescent of the aperture is higher than it is wide, a disposition which always obtains when the spire is oblong or elongated, it constitutes the

Bulimus Terrestris, Brug.

Which requires a still further subdivision:

Bulimus, Lam.

Margin of the aperture tumid in the adult, but without dentations.

Hot climates produce large and splendid species, some of which are remarkable for the volume of their ova, the shell of which is of a stony hardness; and others for their left shell.

Several moderate-sized or small species are found in France, one of which, the *Helix decollata*, Gm.; Chemn., cxxvi, 1254, 1257, has the singular habit of successively fracturing the whorls of the summit of the spire. This is the example referred to, as a proof that the muscles of the animal can be detached from the shell; for at a particular epoch, of all the whorls of the spire originally possessed by this Bulimus, not a single one remains(1).

Pupa, Lam.

Summit of the shell very obtuse; the last whorl, in the adult, narrower than the others, giving it the form of an ellipsoid, or sometimes almost that of a cylinder; the surrounding margin of the aperture tumid and emarginated on the side next to the spire by the preceding whorl. Small species, inhabiting wet places, among mosses, &c.

Sometimes there is no dentation(2).

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(1) Add *Helix ovalis*, Gm., Chemn., IX, cxix, 1020, 1021;—*H. oblonga*, Ib., 1022, 1023;—*H. trifasciata*, Id., CXXXIV, 1215;—*H. dextra*, Ib., 1210, 1212;—*H. interrupta*, Ib., 1213, 1214;—*H.*, Ib., 1215;—*H.*, Ib., 224, 1225;—*H. perversa*, Id., CX and CXI, 928—937;—*H. inversa*, Ib., 925, 926;—*H. contraria*, Id., CXI, 938, 939;—*H. læva*, Ib., 940 and 949;—*H. lubiosa*, Id., CXXXIV, 1234;—*H.*, Ib., 1232; *H.*, Ib., 1231;—*H. cretacea*, Id., CXXXVI, 1263;—*H. pudica*, Id., CXXI, 1042;—*H. calcarea*, Id., CXXXV, 1226.

Bulla auris Malchi, L., Gm., Ib., 1037, 1038, V, Ib., 1041.

Bulimus columba, Brug., Seb., III, lxxi, 61;—*Bul. fasciolatus*, Oliv., Voy., pl. xvii, f. 5. For the small species of France see Draparnaud, Moll. terr. et fluviat., pl. iv, f. 21—32.

(2) *Bulimus labrosus*, Oliv., Voy. pl. xxxi, f. 10, A, B;—*Pupa edentula*, Drap. III, 28, 29;—*Pupa obtusa*, Id., 43, 44;—*Bul. fusus*,, Brug.

More commonly there is one in that portion of the aperture which is closed by the penultimate whorl(1).

It is frequently observed inside of the external edge(2).

CHONDRUS, Cuv.

The aperture, as in the last mentioned Pupæ, indented on the side next to the spine by the preceding whorl and bordered with salient laminæ or teeth; but the form is more ovoid, like that of a common Bulimus.

Some of them have teeth on the margin of the aperture(3).

Others are furnished with more deeply seated laminæ(4).

Here terminate that series of terrestrial Helices, the adult shells of which have a tumid margin round the aperture.

SUCCINEA, Drap.

Shell oval; the aperture higher than it is broad, as in Bulimus, but larger in proportion; margin of the aperture not tumid, and the side of the columella almost concave. The shell will not receive the entire animal, and it might almost be considered as a large-shelled Testacella. Its inferior tentacula are very small, and it lives on the plants and shrubs which line the banks of rivulets, a circumstance which has caused the genus to be considered as amphibious(5).

CLAUSILIA, Drap.

These Mollusca formerly belonged to the genus Turbo of Linnæus, from which it has been found necessary to separate them, in order to approximate them to the terrestrial Helices. The shell is long, slender and pointed, the last whorl, in the adult, narrowed, compressed, slightly detached, and terminated by a complete aperture with a tumid margin, frequently dentated or furnished with laminæ. In the contraction of the last whorl we usually find a little plate bent into an S, the use of which to the living animal is unknown.

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(1) *Turbo uva*, L., Martini, IV, cliii, 1439;—*Turbo muscorum*, L. (*Pupa marginata*, Drap., III, 36, 37, 38);—*Pupa muscorum*, Drap., III, 26, 27 (*Vertigo cylindrica*, Féruss.);—*Pupa umbilicata*, Drap. III, 39, 40;—*P. doliolum*, Ib., 41, 42.

(2) *Hel. vertigo*, Gm., (*Pupa vertigo*, Drap., III, 34, 35);—*Pupa antivertigo*, Ib., 32, 33;—*Pupa pygmæa*, Ib., 30, 31;—*Bulimus ovularis*, Oliv., Voy., XVII, 12, a, b.

(3) *Bulimus zebra*, Ol., XVII, 10;—*Pupa tridens*, Drap., III, 57;—*Pupa variabilis*, Ib., 55, 56.

(4) *Bulimus avenaceus*, Brug., (*Pupa avena*) Drap., III, 47, 48;—*P. secale*, Ib., 49, 50;—*P. frumentum*, Ib., 51, 52;—*Bulimus similis*, Brug.;—*P. cinerea*, Drap., Ib., 53, 54;—*P. polyodon*, IV, 1, 2;—*Helix quadridens*, (*Pupa quadr.*, Drap.) Ib., 3.

(5) *Succinea amphibia*, Drap., IV, 22, 23 (*Helix putris*, L.);—*S. oblonga*, Ib., 24.—The genera COCHLOHYDRA, Féruss., LUCINA, Oken, TASSADE, Huder, correspond to the Succineæ. M. Delamark at first styled them AMPHIBULIMI. The *Amphibulime encapuchonné*, Lam., Ann. du Mus. VI, lv, 1, may also form a Testacella.

The species are very small, living in mosses at the foot of trees, &c. A great many of them are reversed(1).

ACHATINA, Lam.

Necessarily separated from the Bullæ of Linnæus and placed here. The aperture of the oval or oblong shell is higher than it is broad, as in the Bulimi, but wants the tumid margin; the extremity of the columella also is truncated, the first indication of the emarginations which we shall find in so many marine Gasteropoda. These Achatinæ are large Helices, which devour trees and shrubs in hot countries(2).

Montfort distinguishes those, in the last whorl of which we find a callus or peculiar thickening,—LIGUUS, Montf.(3); this whorl is proportionably lower in them than in the others:

And those in which the extremity of the columella is curved towards the inside of the aperture—POLYPHEMUS, Montf.(4); the last whorl is higher. The

PULMONEA AQUATICA

Have but two tentacula, as already stated; they are continually compelled to rise to the surface for the purpose of breathing, so that they cannot inhabit very deep water; they are usually found in fresh water or salt ponds, or at least in the vicinity of the sea coast and of the mouths of rivers. Some of them have no shell, such as

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(1) *Turbo perversus*, L., List., 41, 39;—*T. bidens*, Gm., Drap., IV, 5, 7;—*T. papillaris*, Gm., Drap., Ib., 13; and the other Clausiliæ of Drap., figured on the same plate;—*Bulimus retusus*, Oliv., Voy., XVII, 2;—*Bul. inflatus*, Ib., 3;—*Bul. teres*, Ib., 6;—*Bul. torticollis*, Ib., 4, a, b;—*Turbo tridens*, L., Chemn., IX, xii, 957;—*Clausilia collaris*, Féruss., List., 20, 16.

(2) *Bulla zebra*, L. Chemn., IX, ciii, 875, 876; cxviii, 1014—1016;—*Bulla achatina*, Ib., 1012, 1013;—*Bulla purpurea*, Ib., 1018;—*Bulla dominicensis*, Id., CXVII, 1011;—*Bulla stercus pulicum*, CXX, 1026, 1027;—*Bulla flammea*, Id., CXIX, 1021—1025;—*Helix tenera*, Gm., Ib., 1028, 1030;—*Bulimus bicarinatus*, Brug., List., 37;—*Mélanie buccinoïde*, Oliv., Voy., XVII, 8.

(3) *Bulla virginea*, L., Chemn., IX, cxvii, 1000, 1003; X, clxxiii, 1682, 3.

(4) *Bulimus glans*, Brug., Chemn., IX, cxvii, 1009, 1010.

ONCHIDIUM, Buchan.(1)

A broad, fleshy mantle, in the form of a shield, overlapping the foot at all points, and even covering the head when it contracts; two long retractile tentacula, and on the mouth an emarginated veil, formed of two triangular and depressed lobes.

The anus and respiratory orifice are under the posterior edge of the mantle, where, a little more deeply, we also find the pulmonary cavity. Close to them, on the right, opens the female organ of generation, that of the male, on the contrary, is under the right great tentaculum, the two openings being united by a furrow, which extends along the under part of the whole of the right margin of the mantle. These animals, destitute of jaws, have a muscular gizzard, followed by two membranous stomachs. Several of them inhabit the sea-shore, but in places where the ebb leaves them uncovered, so that they can readily breathe the natural air(2).

The aquatic Pulmonea, with complete shells, were also placed by Linnæus in his genera HELIX, BULLA and VOLUTA, from which it has been found necessary to separate them.

In the first were comprised the two following genera, where we find the internal edge of the aperture crescent-shaped, as in Helix.

PLANORBIS, Brug.(3)

The Planorbes had already been distinguished from the Helices by Brugières, and even previously by Guettard, on account of the slight increase of the whorls of their shell, the convolutions of which are nearly in one plane, and because the aperture is wider than it is high. It contains an animal with long, thin, filiform tentacula, at the inner base of which are the eyes, and from the margin of whose mantle exudes a quantity of a red fluid, which is not, however, its blood. Its stomach is muscular and its food vegetable, like that of the Limnæi, of which, in all our stagnant waters, it is the faithful companion. The

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(1) ONCHIDIUM, a name given to this genus because the first species (*Onchidium typhæ*, Buchan., Lin. Soc. Lond., V, 132) was tuberculous: I now know one that is smooth, the *Onchidium lævigatum*, Cuv., and four or five that are tuberculous: *Onch. Peronii*, Cuv., Ann. du Mus., V, 6;—*Onch. Sloanii*, Cuv., Sloane, Jam., pl. 273, 1 and 2;—*Onch. verruculatum*, Descr. de l'Eg., Moll. Gaster., pl. ii, f. 3;—*Onch. celticum*, Cuv., a small species from the coast of Brittany.

N.B. M. de Blainville has changed the name of *Onchidium* into that of PERONIA, and applied the former to the Vaginulæ. These Peroniæ he places among his CYCLOBRANCHIATA, but I can see no real difference between their respiratory organ and that of the other Pulmonea.

(2) *See* Chamisso, Nov. Act. Nat. Cur., XI, part 1, p. 34, and Van Hasselt, Bullet. Univers., 1824, Sept., Zool., 83.

(3) *Hel. vortex;—H. cornea,—H. spirorbis,—H. planorbis,—H. contorta,—H. nitida,—H. alba,—H. similis*

Limnæus, Lam.(1)

Separated from the Bulimi of Brugière by M. Delamark, has, like a Bulimus, an oblong spine and the aperture higher than it is wide; but the margin, like that of a Succinea, is not reflected, and there is a longitudinal fold in the columella, which runs obliquely into the cavity. The shell is thin; the animal has two compressed, broad, triangular tentacula, near the base of whose inner edge are the eyes. They feed on plants and seeds, and their stomach is a very muscular gizzard, preceded by a crop. Like all the Pulmonea, they are hermaphrodites, and the female organ of generation being far from the other, they are compelled so to copulate, that the individual which acts as a male for one, serves as a female for a third; long strings of them may be observed in this position.

They inhabit stagnant waters in great numbers; they also abound with the Planorbes in certain layers of marl or calcareous strata, which they evidently prove were deposited in fresh water(2).

Physa, Drap.

The Physæ, which were gratuitously placed among the Bullæ, have a shell very similar to that of a Lymnæa, but without the fold in the columella and reflected edge, and very thin. When the animal swims or crawls, it covers its shell with the two notched lobes of its mantle, and has two long, slender and pointed tentacula, on the greatly enlarged internal base of which are the eyes. They inhabit springs, &c.

One of them, *Bulla fontinalis*, L., which is sinistral, is found in France(3).

See the quotations of Gmel., and *add*, Draparnaud, pl. I, f. 39—51, and pl. ii, f. 1—22.

(1) *Hel. stagnalis*, L., of which *H. fragilis* is a variety;—*H. palustris;—H. peregra;—H. limosa;—H. auricularia.* See Drap., pl. ii, f. 28, 42, and pl. iii, f. 1, 7.

(2) The mantle of the *Limn. glutinosus*, like that of the Physæ, is sufficiently ample to envelope its shell. It is the genus AMPHIPEPLEA, Nilson, Moll. succ.

(3) The neighbouring species, *Bull. hypnorum*, L., and *Physa acuta*, and *Scaturiginum*, Drap., require an examination of their animals. *Vide*, Drap., p. 54, et seq.

According to the observations of Van Hasselt, we should place here the

Scarabæus, Montf.

Which has an oval shell, the aperture narrowed by projecting and stout dentations on the side next to the columella, as well as towards the external margin; this margin is enlarged, and as the animal renews it after each semi-whorl, the shell projects most on two opposite lines, and has a compressed appearance.

They feed on aquatic plants in the Archipelago of India(1).

The two following genera were among the Volutæ.

Auricula, Lam.

Differing from all the preceding aquatic Pulmonea in the columella, which is marked with wide and oblique flutes. Their shell is oval or oblong, the aperture elevated as in Bulimus, and the margin tumid. Several are large; we are not certain whether they inhabit marshes like the Lymnæi, or their borders like the Succineæ.

Auricula myosotis, Drap. III, 16, 17; *Carychium myosotis*, Féruss. The only species in France; the animal has but two tentacula and the eyes are at their base; from the shores of the Mediterranean(2).

Conovulus, Lam.—Melampes, Montf.

Projecting folds in the columella, as in the Auriculæ, but the margin of the aperture is not tumid, and the internal lip is finely striated; the general form of the shell is that of a cone, of which the spire forms the base. They inhabit the rivers of the Antilles(3).

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(1) *Helix scarabæus*, L.

(2) Add, *Voluta auris Midæ*, L., Martini, II, xliii, 436—38; Chemn., X, cxlix, 1395, 1396;—*Voluta auris Judæ*, L., Martini, II, xliv, 449—51;—*Vol. auris Sileni*, Born., IX, 3—4;—*Vol. glabra*, Mart., II, xliii, 447, 448;—*Vol. coffea*, Chemn., IX, cxxi, 1044.

(3) *Voluta minuta*, L., Mart., II, xliii, f. 445, or *Bulimus coniformis*, Brug.;—*Bul. monile*, Brug., Mart., Ib., f. 444;—*Bul. ovulus*, Br., Mart., Ib., 446.

ORDER II.

NUDIBRANCHIATA(1).

The Nudibranchiata have no shell whatever; neither are they furnished with a pulmonary cavity, their branchiæ being exposed on some part of the back. They are all hermaphroditical and marine animals, frequently swimming in a reversed position, with the foot on the surface, concave like a batteaux, and employing the margin of their mantle and their tentacula as oars. In the

DORIS, Cuv.(2)

The anus opens on the posterior part of the back, the branchiæ being arranged in a circle round it, under the form of little arbusculæ, the whole resembling a sort of flower. The mouth is a small proboscis, situated under the anterior margin of the mantle, and furnished with two little conical tentacula. Two other claviform tentacula arise from the anterior superior part of the mantle. The openings of the genital organs are approximated under its right margin. The stomach is membranous. A gland interlaced with the liver excretes a peculiar fluid through a hole near the anus. The species are numerous, and some of them large. They are found in every sea, where their ova, resembling gelatinous bands, are diffused over stones, sea-weed, &c.(3) The

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(1) My four first orders are united by M. de Blainville in what he terms a subclass, designating them by the name of PARACEPHALOPHORA MONOICA. He makes two orders of my *Nudibranchiata*; in the first, or the CYCLOBRANCHIATA, he places *Doris* and other analogous genera: in the second, or the POLYBRANCHIATA, are *Tritonia* and the following genera, which he divides in two families, according to the presence of two or four tentacula.

(2) A name first applied by *Linnæus* to an animal of this genus, which, however, he characterized badly. It was afterwards extended by *Muller* and *Gmelin* to almost the whole of the *Nudibranchiata*, and restored by me to its original signification.

(3) Species with an oval mantle projecting beyond the foot: *Doris verrucosa*, L., Cuv., Ann. du Mus., IV, lxxiii, 4, 5;—*Doris argo*, L., Bohatsch, Anim. Mar., V, 4, 5;—*Doris obvelata*, Müll., Zool. Dan., XLVIII, 1, 2;—*Doris fusca*, Id., Ib., LXVII, 6, 9;—*Doris stellata*, Bommé, Act. Fless., I, iii, 4;—*Doris pilosa*, Müll., loc. cit. LXXXV, 5—8;—*D. lævis*, Id., Ib., XLVII, 3—5;—*D. muricata*, Id., LXXXV, 2—4;—*D. tuberculata*, Cuv., Ann. du Mus., IV, lxxiv, 5;—*D. limbata*,

ONCHIDORA, Blainv.

Only differs from Doris in the separation of the genital organs, the orifice of which communicates by a furrow running along the right side as in Onchidium(1). In the

PLOCAMOCEROS, Leuck.

We find all the characters of the Onchidoræ, in addition to which the anterior margin of their mantle is ornamented with numerous branched tentacula(2).

POLYCERA, Cuv.

The branchiæ, as in Doris, on the hind part of the body, but more simple, and followed by two membranous laminæ, which cover them in moments of danger; anterior to the claviform tentacula, similar to those in Doris, are four, and sometimes six others, simply pointed(3).

TRITONIA, Cuv.

The body, superior tentacula and genital organs as in Doris; but the anus and the orifice through which the peculiar liquid is excreted, are on the right behind the organs of generation: the branchiæ, which resemble little trees, are arranged along the sides of the back, and the mouth, provided with broad membranous lips, is armed inside with two horny and trenchant lateral jaws, which may be compared to a pair of sheep-shears.

Trit. Hombergii, Cuv., Ann. du Mus., I, xxxi, 1, 2, and the

Ib., Id., 3;—*D. solea*, Id., Ib., 1, 2;—*D. scabra*, Id., Ib., p. 446;—*D. maculosa*, Id., Ib.;—*D. tomentosa*, Id., Ib.;—*D. nodosa*, Montag., Lin. Trans., IX, vii, 2;—*D. marginata*, Lin., Trans., VII, vii, p. 84;—*D. nigricans*, Otto., Nov. Act. Nat. Cur., XIII, part II, pl. xxvi, f. 1;—*D. grandiflora*, Id., Ib., XXVII, f. 3;—*D. tigrina*, Sav. Egyp., Gasterop., pl. i, p. 3;—*D. concentrisca*, Ib., f. 5;—*D. marmorata*, Ib., f. 6, &c.

Prismatic species, where the mantle is almost as narrow as the foot: *Doris lacera*, Cuv., Ann. du Mus., IV, lxxiii, f. 1 and 2;—*D. atromarginata*, Id., Ib., lxxiv, 6;—*D. pustulosa*, Id., Ib., p. 473;—*D. gracilis*, Rapp., Nov. Act. Nat. Cur. XIII, part II, pl. xxvii, f. 10. See also Van Hassel. Bullet. Univ., 1824, Octob., Zool., p. 235.

(1) *Onchidora Leachii*, Blainv., Malac., pl. xlvi, f. 8.

(2) *Plocamoceros ocellatus*, Leuck., App. Ruppel., Invert., pl. 5, f. 3.

(3) *Doris quadrilineata*, Müll., Zool., Dan., I, xvii, 4—6, and better, Ib., cxxxviii, 5—6;—*D. cornuta*, Ib., cxlv, 1, 2, 3;—*D. flava*, Lin. Trans., VII, vii, p. 84;—*Polycera lineata*, Risso, Hist., Nat., IV, pl. i, f. 5.

Journ. de Phys., 1785, October, pl. ii. A large species of a copper colour, from the coast of France.

The same locality produces many others which vary greatly in size and the form of their branchiæ(1); several of them are very small(2).

THETHYS, Lin.(3)

Two rows of branchiæ resembling branching tufts along the back, and a very large membranous and fringed veil on the head, which shortens as it curves under the mouth; this latter is a membranous proboscis without jaws; on the base of the veil are two compressed tentacula, from whose margin projects a small conical point. The orifices of the genital organs, of the anus, and of the peculiar fluid are situated as in the Tritoniæ. The stomach is membranous and the intestine very short.

T. fimbria, L.; Cuv., Ann. du Mus., XII, xxiv(4). Grey, spotted with white; a beautiful species from the Mediterranean.

SCYLLÆA, Lin.

Body compressed; the foot narrow and marked with a furrow which enables it to clasp the stems of the fuci; no veil; the mouth resembling a little proboscis; orifices as in Thethys; the compressed tentacula terminated by a cavity, from which issues a little uneven point, and two pairs of membranous crests on the back, the internal surface of which is furnished with pencils of filaments, which are the branchiæ. The middle of the stomach is invested with a fleshy ring, internally armed with horny and trenchant laminæ, like knives.

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(1) Such are *Trit. elegans*, Descr. de l'Eg., Zool., Gaster., pl. 2, f. 1;—*Trit. rubra*, Leuck., App., Rupp., Invert., pl. 4, f. 1;—*Tr. glauca*, Ib., f. 2;—*T. cyanobranchiata*, Ib., f. 3;—*T. arborescens*, Cuv., Ann. du Mus., VI, lxi, and three others, at least closely allied;—*Doris arborescens*, Stræm., Act. Hafn., X, v, 5;—*Doris frondosa*, Ascan., Act. Dronth., V, v, 2, and *Doris cervina*, Bommé, Act. Fless., I, iii, 1.

(2) *Doris coronata*, Bommé, Ib., and *Doris pinnatifida*, Lin. Trans., VII, vii, which is closely allied to it;—*Doris fimbriata*, Müll., Zool. Dan., CXXXVIII, 2, and probably *Doris clavigera*, Mull., Ib., XVII, 1—3. Perhaps the *Doris lacera*, Zool. Dan., CXXXVIII, 3, 4, should also be referred to this genus.

(3) From ϑεϑυον, a name employed by the ancients to designate the Ascidiæ; Linnæus applied it to this genus.

(4) The difference observed between the *Thethys fimbriata*, Bohatsch., Anim. Mar., pl. v, and the *Thethys leporina*, Fab., Column., Ag., pl. xxvi, appears to me to be the result of a greater or less degree of preservation.

S. pelagica, L.; Cuv., Ann. du Mus., VI, lxi, 1, 3, 4. Common on the floating fucus of almost every sea.

Glaucus, Forster.

Body elongated; orifices of the anus and of the genital organs as in the preceding; four very small conical tentacula, and on each side three branchiæ, each of which are formed of long slips arranged like the sticks of a fan, which also aid them in swimming. They are beautiful little animals, that inhabit the Mediterranean and the Atlantic, prettily coloured with blue and nacre; they swim on their back with great swiftness. Their anatomical structure is very similar to that of the Tritonia, but the species are not yet well ascertained(1).

Laniogerus, Blainv.

Two series, on each side, of small and finely pectinated laminæ, which are the branchiæ; the body shorter and thicker than that of a Glaucus, but there are four small similar tentacula(2).

Eolidia, Cuv.

Resembles a small Limax in form; four tentacula above, and two on the sides of the mouth; the branchiæ composed of laminæ, arranged like scales, mere or less crowded, on each side of the back. Found in every sea(3).

Cavolina, Brug.,

The tentacula of the Eolidiæ; with retiform branchiæ, arranged in transverse rows on the back(4).

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(1) *Doris radiata*, Gm., Dup., Phil. Trans., LIII, pl. iii;—*Scyllée macrée*, Bosc., Hist. des Vers;—*Glaucus atlanticus*, Blumenb., fig., Nat. Hist., pl. 48, and Manuel., fr. trans., II, p. 22; Cuv., Ann. du Mus., VI, lxi, ii, Péron, Ann. Mus. XV, iii, 9.

(2) *Laniogerus Elfortii*, Blainv., Malac., pl. xlvi, f. 4.

(3) *Doris papillosa*, Zool. Dan., CXLIX, 1—4;—*Doris bodoensis*, Gunner., Act. Hafn., X, 170;—*Doris minima*, Forsk., Ic., xxvi, H;—*Doris fasciculata*, Id., Ib., G;—*Doris branchialis*, Zool. Dan. CXLIX, 5—7;—*Doris cœrulea*, Lin. Trans., VII, vii, 84;—*Eolidia histrix*, Otto., Nov. Act. Nat. Cur., XI, xxxviii, 2, &c.

(4) *Doris peregrina*, Gm., Cavolini, Polyp. Mar., VII, 3;—*Eolidia annulicornis*, Chamisso, Nov. Act. Nat. Cur., XI, part II, pl. xxiv, f. 1;—*Doris longicornis*, Lin. Trans., IX, vii, 114?

N.B. This genus must not be confounded with the *Cavolina* of Abildgard, which is the *Hyalæa*.

FLABELLINA, Cuv.

The tentacula of the Eolidæ, with radiating rectiform branchiæ, supported by five or six pedicles on each side; they are closely allied to the Glauci, and in fact to all the Nudibranchiata, whose branchiæ are situated on the sides of the back(1).

TERGIPES, Cuv.

The form of the Eolidiæ, but only two tentacula, with a range of cylindrical branchiæ on both sides of the back, each of which is terminated by a little sucker or cup, and which are used by the animal as feet, to walk on its back. The species known are very small(2).

BUSIRIS, Risso.

The body oblong, and back convex; two filiform tentacula, and behind them, on the nape, two plumiform branchiæ(3).

PLACOBRANCHUS, Van Hasselt.

Two tentacula and as many labial lobes; the whole back, widened by its margin, is covered with numerous radiating striæ, which are the branchiæ. In its ordinary condition the widened borders of the mantle are turned up, and cross each other to form an envelope for the branchiæ, which are thus enclosed, as in a cylindrical case.

They are small Mollusca, from the Indian Ocean(4).

ORDER III.

INFEROBRANCHIATA.

The Inferobranchiata have nearly the same form and organization observed in Doris and Tritonia, but their branchiæ, instead of being placed on the back, resemble two long series of laminæ, situated on the two sides of the body, under the projecting margin of the mantle.

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(1) *Doris affinis*, Gm., Cavol., Polyp. Mar., VII, 4.

(2) *Limax tergipes*, Forsk.. XXVI, E, or *Doris lacinulata*, Gm.;—*Doris maculata*, Lin. Trans., VII, vii, 34;—*Doris pennata*, Bommé, Act. Fless., I, iii, 3?

(3) *Busiris griseus*, Risso, Hist. Nat. Mar., IV, pl. i, f. 6.

(4) In the species known (*Placobranchus Hasselti*, Cuv.), the branchial striæ are green, and the body a brown-grey sprinkled with little ocelli, Van Hasselt., Bullet. Univ., Oct., 1824, p. 240. Messrs Quoy and Gaymard found it at the Friendly Islands.

PHYLLIDIA, Cuv.

The mantle naked, usually coriaceous, and without any shell; the mouth, a small proboscis, each side of which is furnished with a tentaculum; two others project from above two small cavities in the mantle. The anus is on the hind part of the mantle, and the genital orifices forward, under the right side; the heart near the middle of the back; the stomach simple and membranous, and the intestine short.

Several species inhabit the Indian Ocean(1).

DIPHYLLIDIA, Cuv.

The branchiæ similar to those of the Phyllidiæ, but the posterior part of the mantle more pointed; on each side of the semicircular head a pointed tentaculum and a slight tubercle; the anus on the right side(2).

ORDER IV.

TECTIBRANCHIATA(3).

The branchiæ along the right side or on the back, composed of laminæ more or less divided, but not symmetrical; they are more or less covered by the mantle, in which a small shell is generally contained. They approach the Pectinibranchiata in the form of the organs of respiration, and like them inhabit the Ocean; but they are all hermaphrodites like the Nudibranchiata and the Pulmonea.

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(1) *Phyllidia trilineata*, Seb., III, i, 16; Cuv., Ann. du Mus., V, xviii, 1; and Zool., Voy. Freycin., pl. 87, f. 7—10;—*Ph. ocellata*, Cuv., Ib. 7;—*Ph. pustulosa*, Id. Ib. 8, and some new species.

(2) *Diphyllidia Brugmansii*, Cuv.;—*Diphyll. lineata*, Otto., Nov. Act. Nat. Cur., X, vii, or *Pleuro-phyllidia*, Meckel., Germ. Archiv., VIII, p. 190, pl. ii, delle Chiaie, Mem., X, 12.

N.B. The *Linguelle* of Elfort, Blainv., Malac., pl. xlvii, f. 2, does not appear to differ from our first species.

(3) M. de Blainville has given to this order the name of MONOPLEUROBRANCHIATA.

PLEUROBRANCHUS, Cuv.

The body equally overlapped by the mantle and by the foot, as if it were between two shields. In some species a little oval calcareous lamina is contained in the mantle, and a horny one in that of others; the mantle is emarginated above the head. The branchiæ are attached along the right side in the furrow, between the mantle and the foot, forming a series of pyramids divided into triangular laminulæ. The mouth, a small proboscis, is surmounted by an emarginated lip and by two tubular and cleft tentacula; the genital orifices are before, and the anus behind the branchiæ. There are four stomachs, the second of which is fleshy and sometimes armed with bony appendages, and the third, furnished internally with salient longitudinal laminæ; the intestine is short.

Various species inhabit both the Mediterranean and the Atlantic, some of which are large and marked with the most beautiful colours(1).

PLEUROBRANCHÆA, Meckel.—PLEUROBRANCHIDIUM, Bl.

The branchiæ and genital orifices situated as in Pleurobranchus; but the anus is above the branchiæ, the margin of the mantle and foot project but little, and on the fore part of the former are four short, distant tentacula, forming a square that reminds the observer of the anterior disk of the Aceræ. I can find but one stomach, which is merely a dilatation of the canal, with thin parietes.

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(1) *Pleurobranchus Peronii*, Cuv., Ann. du Mus., V, xviii, 1, 2;—*Pl. tuberculatus*, Meckel., Anat. Compar., I, v, 33—40; and some new species, such as the *Pleur. oblongus*, Descr. de l'Eg., Moll. Gaster., pl. iii, f. 1;—*Pl. aurantiacus*, Id., Risso., Hist. Nat. Merid. IV, pl. i, f. 8;—*Pl. luniceps*, Cuv.;—*Pl. Forskalii*, Forsk., pl. xxviii, and Leuckard, App., Ruppel., An. Invert., pl. v;—*Pl. citrinus*, Ib., f. 1.

The genus LAMELLARIA, Montag., Lin. Trans., XI, pl. xii, f. 3 and 4, does not appear to me to differ in any essential point from Pleurobranchus; the same observation applies to the BERTHELLA of Blainv., Malac., pl. xliii, f. 1. The latter is distinguished merely because the mantle is not emarginated above the head, as is the case in many species of Pleurobranchus. The *Pl. oblongus* would belong to it, and even the *Pl. luniceps*.

A multifidous glandular organ opens behind the genital orifices; there is no vestige of a shell.

Pleurob. Meckelii, Leve, Diss. de Pleur., 1813(1). The only species known; from the Mediterranean.

APLYSIA, Lin.(2)

The margin of the foot turned up into flexible crests, surrounding the back, and even susceptible of being reflected over it; the head supported by a neck more or less long; two superior tentacula excavated like the ears of a quadruped, with two flattened ones on the edge of the lower lip; the eyes above the former. The branchiæ are on the back, and consist of highly complicated lamellæ attached to a broad membranous pedicle, covered by a small membranous mantle, in the thickness of which is a flat and horny shell. The anus opens behind the branchiæ and is frequently concealed under the lateral crests; the vulva is before on the right, and the penis projects from under the right tentaculum. The seminal fluid is conducted in coitu, from the penis to the vulva by a groove, which extends from one to the other. An enormous membranous crop leads to a muscular gizzard, armed internally with cartilaginous and pyramidal corpuscles, which is followed by a third stomach sown with sharp hooks, and by a fourth in the form of a cæcum. The intestine is voluminous, and the animal feeds on fucus. A limpid humour, secreted by a particular gland, and which in certain species is said to be extremely acrid, is exuded through an orifice near the vulva, and from the edges of the mantle oozes an abundant liquid of a deep purple colour, with which, when in danger, the animal tinges the water for a considerable extent. The ova are deposited in a kind of long, interlaced, glairy net work, of extreme tenuity. In the seas of Europe we have:

Apl. fasciata, Poiret; Rang. Apl., pl. vi, vii. Black; margined with lateral red crests; one of the large species.

Apl. punctata, Cuv.; Ann. du Mus. tome II, p. 287, pl. 1, f. 2—4; Rang, Apl., pl. xviii, f. 2. Lilac, sprinkled with greenish points.

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(1) It is the genus *Pleurobranchidium* of Blainv., Malac., pl. xliii, f. 3; but not as he thinks the *Pleurobranchus tuberculatus* of Meckel.

(2) **Απλυσια**, which cannot clean itself,—a name given by Aristotle to certain Zoophytes. Linnæus erroneously applied it as above. The animals here spoken of were well known to the ancients, who styled them Sea-Hares, and attributed to them many fabulous properties.

Apl. depilans, L.; Bohatch., Anim. Mar. pl. i and ii; Rang, pl. xvi. Blackish, with large greyish, clouded spots.

Several other species are found in distant seas(1).

DOLABELLA, Lam.

The Dolabellæ only differ from the Aplysiæ in the position of the branchiæ and their surrounding envelope; they are at the posterior extremity of the body, which resembles a truncated cone. Their lateral crest presses closely on their branchial apparatus, merely leaving a narrow furrow; their shell is calcareous. They are found in the Mediterranean and in the Indian Ocean(2).

NOTARCHUS, Cuv.

The lateral crests united and covering the back, a longitudinal emargination excepted, that leads to the branchiæ, which have no mantle to cover them, but are otherwise like those of the Aplysiæ; the rest of their organization is always the same(3). In the

BURSATELLA, Blainv.

The lateral crests are united in front in such a manner as only to leave an oval aperture for the transmission of water to the branchiæ, which are also deprived of a protecting mantle(4).

These two genera, however, probably form but one.

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(1) *Aplysia brasiliana*, Rang, pl. viii, 1, 2, 3;—*A. dactylomela*, Id., IX;—*A. protea*, Id., X, 1;—*A. sorex*, Id., X, 4, 5, 6;—*A. tigrina*, Id., XI;—*A. maculata*, Id. XII, 1—5;—*A. marmorata*, Blainv., Journ. de Phys., Janv., 1823, Rang, XII, 6, 7;—*A. Keraudrenii*, Id., XIII;—*A. Lessonii*, Id., XIV;—*A. camelus*, Cuv., Ann. du Mus., and Rang, XV, 1;—*A. alba*, Cuv., Ib., and Rang, XV, 2, 3;—*A. napolitana*, Id., XV, bis;—*A. virescens*, Risso, Hist. Nat. Mer., pl. 1, 7. It is well, however, to observe, that most of the Aplysiæ having been drawn from specimens preserved in spirits, the truth of the specific characters of some of them may be doubted.

(2) *Dolabella Rumphii*, Cuv., Ann. du Mus., V, xxix, 1; and Rumph. Thes. Amb., pl. x, 6, from the Molluccas, or *Aplysia Rumphii*, Rang, pl. i;—*Apl. ecaudata*, Rang, pl. ii;—*A. truncata*, Id.;—*A. teremidi*, Id. III, 1;—*A. gigas*, Id., III, 4;—*A. Hasseltii*, Id., XXIV, 1.

(3) *Notarchus gelatinosus*, Cuv., to which M. Rang associates the *Bursatella Savigniana*, Descr. de l'Eg., Zool., Gaster., pl. ii, f. 1, 2, and Rang, *Apl.*, pl. xx, and his *Apl. Pleii*, pl. xxi, and some small species.

(4) *Bursatella Leachii*, Blainv., Malac., pl. xliii, f. 6.

N.B. Authors have also approximated to the Aplysiæ the *Apl. viridis*, Montag., Lin. Trans., VII, pl. vii, which forms the genus ACTÆON of Oken, and which is at least closely allied to the *Elysie timide*, Risso, Hist. Nat. Mer., IV, pl. i, f. 3, 4; as I am not acquainted with the branchiæ of either, I cannot class them.

AKERA, Muller.

The branchiæ covered, as in the preceding genera, but their tentacula are so shortened, widened and separated, that they seem to be totally wanting, or rather to form a large, fleshy, and nearly rectangular shield, under which are the eyes. Independently of this, the hermaphroditism of these animals, the position of their genital organs, the complication and armature of their stomach, and the purple liquid effused by several of their species, approximate them to the Aplysiæ. The shell, of such as have any, is more or less convoluted, but with little obliquity, and is without a projecting spire, emargination, or canal; the columella, projecting convexly, gives a crescent-like figure to the aperture, the part opposite to the spire being always the broadest and most rounded.

M. de Lamarck names those in which the shell is concealed in the thickness of the mantle, BULLÆA. It has but very few whorls, and the animal is much too large to be drawn into it.

Bullæa aperta, Lam.; *Bulla aperta* and *Lobaria quadriloba*, Gm.; *Phyline quadripartita*, Ascan.; Müll., Zool. Dan., III, pl. ci; Blanc., Conch. Min. Not., pl. xi; Cuv., Ann. du Mus. t. I, pl. xii, 6(1). The animal is whitish, and about an inch long; the fleshy shield, formed by the vestiges of its tentacula, the lateral swellings of its foot, and the mantle occupied by the shell, seem to divide its upper surface into four lobes. Its thin, white, semi-diaphanous shell, is nearly all aperture, and its gizzard is armed with three very thick rhomboidal pieces of bone. It is found in almost every sea, where it lives on oozy bottoms.

M. de Lamarck leaves the name of BULLA(2) to those species whose shell, merely covered with a slight epidermis, is large enough to shelter the animal. It is somewhat more convoluted than in Bullæa.

Bulla lignaria, L.; Martini, I, xxi, 194, 95; Cuv., Ann. du Mus., XVI, 1; Pol. Test. Neap., III, pl. xlvi. The oblong shell, with its concealed spire and ample aperture, very wide anteriorly, resembles a loosely rolled lamina, streaked in the direction of its whorls. The stomach of the animal is armed with two large semi-oval osseous pieces, and with a small compressed one(1).

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(1) The *Sormet*, Adans., Senegal, pl. i, f. 1, is a species closely allied to Bullæa; but I cannot establish a genus, or even a species, upon so imperfect a document.

(2) The genus *Bulla*, Lin., not only comprised the *Akeræ*, but also the *Auriculæ*, *Agatinæ*, *Physæ*, *Ovulæ* and *Terebella*, animals between which there is much difference. *Brugières* commenced the work of reformation by separating the *Agatinæ* and the *Auriculæ*, which he united to the *Lymnei* in the genus *Bulimus*; *M. de Lamarck* finished it by creating all the genera we have just named.

Bulla ampulla, L.; Martini, I, xxii, 20, 204; Cuv., Ann. du Mus., XVI, 1. The shell oval, thick, clouded with grey and brown; the stomach furnished with three black, very convex, rhomboidal pieces.

Bulla hydatis, L.; Chemn. IX, cxviii, 1019; Cuv., Ann. du Mus., XVI, 1. Shell round, thin, and semi-diaphanous; the last whorl, and consequently the aperture, higher than the spire; three small scutelliform pieces in the gizzard(2).

We reserve the name of Akera, properly so called, Doridium, Meck., Lobaria, Blainv., for those species which have no shell whatever, or only a vestige of one behind, although their mantle has its external form.

A small species, *Bulla carnosa*, Cuv., Ann. du Mus., XVI, 1; Meck., Anat. Compar., II, vii, 1, 3; Blainv. Malac., pl. xlv, f. 3, is found in the Mediterranean. The only armature of the stomach is the mantle; its fleshy œsophagus is extremely thick.

A tuberculous species, *Doridium Meckelii*, Delle Chiaie Memor., pl. x, f. 1—5, inhabits the same sea. The

Gastropteron, Meck.

Appears to be an Akera, the margin of whose foot is extended into broad wings, used in natation, which it effects on its back. It has no shell, nor has the stomach any armature; a slight fold of skin is the only vestige of a branchial operculum that is perceptible.

G. Meckelii; Rosse, Diss. de Pteropodum Ordine, Halæ, 1813, f. 11—13; and Blainv., Malacol., pl. xlv, f. 5; or *Clio amati*, Delle Chiaie, Memor., pl. ii, f. 1—8. A small animal an inch long and two broad, the wings being extended. From the Mediterranean.

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(1) Gioëni having observed this stomach separate from the animal, mistook it for a shell, and made a genus of it, to which he gave his own name (The *Tricla* of Retzius, *Char*, Brug.). Gioëni even went so far as to describe its pretended habits. Draparnaud was the first who perceived this mixture of error and fraud.

(2) Add, *Bulla naucum*;—*Bulla physis*. Muller describes smaller ones, such as the *Akera bullata*, Zool. Dan., LXXI, or *Bulla akera*, Gm.

GASTROPLAX, Blainv.—UMBRELLA, Lam.

Until the anatomy of this singular genus be more closely investigated, we are compelled to place it among the Tectibranchiata, and even near Pleurobranchus. The animal is large and circular, the foot projects considerably beyond the mantle, and its upper surface is studded with tubercles. The viscera are in a round, superior, and central part. The mantle is only visible by its slightly projecting and trenchant edges, along the whole of the front and of the right side. The lamellated pyramidal branchiæ, like those of Pleurobranchus, are under this slight margin, and behind them is a tubular anus. Under this same margin and forwards, are two tentacula, longitudinally cleft, as in Pleurobranchus, at whose internal base are the eyes; between them is a kind of proboscis, which may possibly be the organ of generation. There is a large concave space in the anterior margin of the foot, the edges of which are susceptible of being drawn up like the mouth of a purse, and at the bottom of which is a tubercle, pierced by an orifice, which perhaps is the mouth, and surmounted by a fringed membrane. The inferior surface of the foot is smooth, and serves the animal to crawl on, as in the other Gasteropoda.

The shell is stony, flat, irregularly rounded, thickest in the middle, with trenchant edges, and marked with slightly concentric striæ. It was at first thought to be attached to the foot, but more recent observation has proved that it is on the mantle and in the usual place(1).

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(1) In the specimen from the British Museum described by M. de Blainville, Bullet. Phil., 1819, p. 178; by the name of GASTROPLAX, the shell is, in fact, attached to the under part of the foot, and by what means it is difficult to determine; the mantle, however, is so thin, that it seems as if it must have been protected by the shell. M. Reynaud has just brought to France a specimen which had lost its shell, but where, it appears, traces of the membranes which attached it to the mantle can be perceived, notwithstanding which, no remains of muscles are visible. A similar shell is also found in the Mediterranean; its animal, however, has not yet been observed.

ORDER V.

HETEROPODA, Lam.(1)

The Heteropoda are distinguished by their foot, which, instead of forming a horizontal disk, is compressed into a vertical muscular lamina, which they use as a fin, and on the edge of which, in several species, is a dilatation forming a hollow cone, that represents the disk of the other orders. Their branchiæ, composed of plumiform lobes, are situated on the hind part of the back, directed forwards, and immediately in their rear are the heart and a small liver, with part of the viscera and the internal organs of generation. Their body, a gelatinous and transparent substance lined with a muscular layer, is elongated and usually terminated by a compressed tail. There is a muscular mass belonging to the mouth, and a tongue furnished with little hooks; the œsophagus is very long; their stomach thin; two prominent tubes on the right side of the visceral bundle afford a passage to the fæces, semen and ova. They usually swim on their back with the foot upwards(2). They have the faculty of distending their body by filling it with water, in a way not well understood. Forskahl comprised them all in his genus

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(1) M. de Blainville makes a family of the HETEROPODA, which he names NECTOPODA, and unites them in his order of the NUCLEOBRANCHIATA with another family that he calls PTEROPODA, and which, of all my Pteropoda, only includes the *Limacina*. He joins the *Argonauta* with it, on account of some conjecture, of which I am ignorant.

(2) This mode of natation induced Péron to think that the natatory blade was on the back, and the heart and branchiæ under the belly, and has given rise to many errors as respects the place of these animals. A simple inspection of their nervous system led me to suppose, in my Memoirs on the Mollusca, that they were analogous to the *Gasteropoda*. A more exact anatomical investigation, made since then, with that given by M. Poli in his vol. III, fully confirms my supposition. The fact is, that there is but little difference between the *Heteropoda* and the *Tectibranchiata*, notwithstanding which, M. Laurillard believes their sexes to be separated.

Pterotrachea, Forsk.,

But we have been compelled to subdivide them.

Carinaria, Lam.(1)

The nucleus formed of the heart, liver and organs of generation, covered by a slender, symmetrical shell, the point of which is bent backwards and frequently relieved by a crest, under whose anterior edge float the feathers of the branchiæ; two tentacula on the head, and the eyes behind their base.

One species, *Carinaria cymbium*, Lam.; Péron, Ann. du Mus., XV, iii, 15; Poli, III, xliv; Ann. des Sc. Nat., tome XVI, pl. 1, inhabits the Mediterranean.

Another, the *Carinaria fragilis*, Bory Saint-Vincent, Voy. aux Isles d'Afr., I, vi, 4(2), is found in the Indian Ocean.

The *Argonauta vitrea* of authors, Favanne, vii, c, 2; Martini, I, xiii, 163, must be the shell of a large Carinaria, but the animal is not yet known.

Atlanta, Lesueur(3).

The Atlantæ of Lesueur, according to the recent observations of M. Rang, are animals of this order, the shell of which, instead of being well opened like that of a Carinaria, has a narrow cavity, spirally convoluted on one plane; its contour is relieved by a thin crest.

They are extremely small Mollusca from the Indian Ocean, in one of which Lamanon thought he had discovered the original Cornu Ammonis(4)—*Atlanta Peronii* and *Atlanta Keraudrenii*, Lesueur, Journ. de Phys., lxxxv, Novemb. 1817; and Rang, Mem. de la Soc. d'Hist. Nat., tome III, p. 373, and pl. ix.

Firola, Péron.

The body, tail, foot, branchiæ and visceral mass as in the Carinaria, but no shell has ever been observed; the snout is elongated into a recurved proboscis, and the eyes are not preceded by tentacula. From the end of the tail is frequently observed to proceed a long articulated fillet, which Forskahl took for a Tænia, and whose nature is not yet very clearly ascertained.

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(1) Forskahl comprised all these animals in his genus Pterotrachea, for which name Brugière substituted that of Firola. Péron having divided the genus, appropriated the name of *Carinaria* to those with a shell, and that of *Firola* to the others. Rondelet gives the *Carinaria*, but without its shell—" De Insect. Zooph. cap. XX."

(2) Add: *Carinaria depressa*, Rang, Ann. des Sc. Nat., Feb. 1829, p. 156.

(3) We must not confound the *Atlantæ* of Lesueur with the *Atlas* described by him in the same place, and which, so confused is his description, I do not know how to class.

(4) Voyage de Lapeyrouse, IV, p. 131, and pl. 63, f. 1—4.

One species, the *Pterotrachea coronata*, Forsk.; Péron., Ann. du Mus., XV, ii, 8, is very common in the Mediterranean, and M. Lesueur describes several from the same sea, which he considers as different—Journ. Acad. Nat. Sc. Philad., Vol. I, p. 3, but which require further comparison(1).

M. Lesueur distinguishes the FIROLOIDÆ, where the body, instead of terminating in a compressed tail, is abruptly truncated behind the visceral bundle, Ib. p. 37(2).

To these two, now well known genera, I presume we must add, when better understood, the

TIMORIENNA, Quoy and Gaym.

Voy. de Freycin., Zool. pl. lxxxvii, f. 1, which appears to be a Firola divested of its foot and bundle of viscera; and the

MONOPHORA, Id.(3),

Voy. de Freycin., Zool. pl. lxxxvii, f. 4, 5, which has nearly the form of a Carinaria, but is without a foot, distinct bundle of viscera, and shell.

We are not so certain that we should place there the

PHYLLIROE, Péron.,

Ann. du Mus., XV, pl. ii, f. 1, where the transparent and strongly compressed body has a snout before, surmounted by two long tentacula without eyes, a truncated tail behind, and which allows its heart, nervous system, stomach, and genital organs of both sexes to be seen through the integuments. The genital orifices and that of the anus are on the right side, and sometimes a tolerably long penis

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(1) *Firola mutica;—F. gibbosa;—F. Forskalea;—F. Cuviera,* which is the *Pterotrachea coronata,* Forsk.;—*F. Frederica,* copied Malacol. Blainv., pl. xlvii, f. 4;—*F. Peronii.*—Add: *Pterotrachea rufa,* Quoy and Gaym., Voy. de Freycin., Zool. pl. 87, f. 2 and 3.

(2) *Firoloïda Demarestia;—Fir. Blainvilliana;—Fir. aculeata,* Less.

(3) We must not confound them with the Monophoræ of M. Bory Saint-Vincent, (Voy. aux Isles d'Afr.,) which are Pyrosomæ.

is visible; I can find no other organ of respiration than its thin and vascular skin(1).

ORDER VI.

PECTINIBRANCHIATA(2).

This order forms beyond all comparison the most numerous division, inasmuch as it comprises the whole of the spiral univalves, and several that are simply conical. Their branchiæ, composed of numerous lamellæ or strips laid parallel with each other, like the teeth of a comb, are attached on one, two, or three lines, according to the genus, to the ceiling of the pulmonary cavity, which occupies the last whorl of the shell, and which has a large opening between the edge of the mantle and the body.

In two genera only, *Cyclostoma* and *Helicina*, do we find, instead of branchiæ, a vascular network, covering the ceiling of a cavity, that is otherwise similar; they are the only ones that respire the natural air: all the others respire water.

All the Pectinibranchiata have two tentacula and two eyes, sometimes placed on particular pedicles, and a mouth resembling a more or less elongated proboscis; the sexes are separated. The penis of the male, attached to the right side of the neck, cannot usually be retracted within the body, but is reflected into the cavity of the branchiæ; it is sometimes very stout, and the Paludina is the only one which can retract it through an orifice perforated in its right tentaculum. The rectum and oviduct of the female also run along the right side of this cavity, and between them and the branchiæ is a peculiar organ composed of cells, from which exudes an extremely viscid fluid, that forms a common envelope which contains the ova, and which is deposited with them. The figure of this envelope is often very complex and singular(1).

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(1) These observations are made from individuals presented to me by M. Quoy. M. de Blainville makes a family of *Phillirœ*, which he names PSILLOSOMA, and which is the third of his APOROBRANCHIATA: the others are Hyalæ, &c.

(2) M. de Blainville's sub-class PARACEPHALOPHORA DIOICA.

Their tongue is armed with little hooks, and by slow and repeated rubbing acts upon the hardest bodies.

The greatest difference in these animals consists in the presence or absence of the little canal formed by a prolongation of the edge of the pulmonary cavity of the left side, and which passes through a similar canal or emargination in the shell, to enable the animal to breathe without leaving its shelter. There is also this distinction between the genera—some of them have no operculum; the species differ from each other by the filaments, fringes, and other ornaments of the head, foot, or mantle.

These Mollusca are arranged in several families according to the forms of their shells, which appear to bear a constant relation to that of the animal.

FAMILY I.

TROCHOIDA.

This family is known by the shell, the aperture of which is entire, without an emargination or canal for a siphon of the mantle, as the animal has none, and is furnished with an operculum or some organ in place of it(2).

TROCHUS, Lin.(3)

The external margin of the angular aperture approaching more or less to a perfect quadrangular figure, and in an oblique plane, with respect to the axis of the shell, because the part of the margin next to the spire projects more than the rest. Most of these animals have three filaments on each edge of the mantle, or at least some appendages to the sides of the feet.

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(1) For Murex, see Lister, 881, Baster, Op. Subs., I, vi, 1, 2; for *Buccinum*, Baster, Ib. V, 2, 3.

(2) They are the PARACEPHALOPHORA DIOICA ASIPHONOBRANCHIATA of Blainville.

(3) This great genus constitutes the family GONIOSTOMA, Blainv.

Of those that have no umbilicus, there are some in which the columella, that has the form of a concave arch, is continuous with the external margin, without any projection. It is the angle and projection of this margin which distinguishes them from Turbo—TECTARIUM, Montf.(1)

Several are flattened, with a trenchant edge, which has caused them to be compared to the rowel of a spur—CALCAR, Montf.(2)

Some again are slightly depressed, orbicular and shining, with a semi-round aperture, the columella convex and callous—ROTELLA, Lam.(3)

The columella of others is distinguished near the base by a little prominence, or vestige of a tooth, similar to that of the Monodontes, from which these Trochi only differ in the angle of their aperture, and the projection of their margin. The aperture is usually about as high as it is wide—CANTHARIS, Montf.(4)

In some of them, on the contrary, the aperture is much wider than it is high, and their convex base approximates them to the Calyptracea—INFUNDIBULUM, Montf.(5)

In others again, where the aperture is also much wider than it is high, the columella forms a spiral canal(6).

Those which have a turreted shell approach Cerithium—TELESCOPIUM, Montf.(7)

Among the umbilicated Trochi, there are some in which there is no projection in the columella; most of them are flattened, and have the external angle trenchant. Of this number is

> *Tr. agglutinans*, L.; Chemn., V, clxxii, 1688, 9. Remarkable for the habit of glueing to its shell, and even incorporating

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(1) *Troch. inermis*, Chemn., V, clxxiii, 1712—13;—*Tr. Cookii*, Id., clxiv, 1551;—*Tr. carlatus*, Id., clxii, 1536—37;—*Tr. imbricatus*, Ib., 1532—33;—*Tr. tuber*, Id., clxv, 1573—74;—*Tr. sinensis*, Ib., 1564—65;—*Turbo pagodus*, Id., clxiii, 1541—42;—*Turbo tectum-persicum*, Ib., 1543—44.

(2) *Turbo calcar*, L., Chemn., V, clxiv, 1552;—*T. stellaris*, Id, 1553;—*T. aculeatus*, Id., 1554—57;—*T. imperialis*, Id., 1714.

(3) *Tr. vestiarius*, L., Chemn., V, clxvi, 1601.

(4) *Tr. iris*, Chemn., 1522—23;—*Tr. granatum*, Ib., 1654—55;—*Tr zyzyphinus*, Ib., clxvi, 1592—98;—*Tr. conus*, clxvii, 1610;—*Tr. maculatus*, clxviii, 1617—18;—*Tr. americanus*, clxii, 1534—35;—*Tr. conulus*, Gualt., LXX, M.

(5) *Trochus concavus*, Chemn., V, clxxviii, 1620, 21.

(6) *Trochus foveolatus*, Chemn., V, clxi, 1516—19;—*Tr. mauritianus*, Id., clxiii, 1547—48;—*Tr. fenestratus*, Ib., 1549—50;—*Tr. obeliscus*, clx, 1510—12.

(7) *Trochus telescopium*, Chemn., V, clx, 1507—9.

with it, as fast as it increases in size, various foreign bodies, such as little pebbles, fragments of other shells, &c.; it frequently covers its umbilicus with a testaceous plate(1).

The margin of others, however, is rounded, such as

Tr. cinerarius, L.; Chemn., V, clxxi, 1686. A small species, and the most common on the coast of France; greenish, obliquely streaked with violet.

Some umbilicated Trochi have a prominence near the bottom of the columella(2),

And, finally, there are others in which it is longitudinally crenate(3). The

SOLARIUM, Lam.

Is distinguished from all other Trochi by a very broad conical spire, at the base of which is an extremely wide umbilicus in which may be seen the internal edges of all the whorls, marked by a crenated cord(4).

EVOMPHALUS, Sowerby.

Fossil shells resembling a Solarium, but wanting the dentations on the internal whorls of the umbilicus(5). The genus

TURBO, Lin.(6)

Comprehends all the species with a completely and regularly turbinated shell, and a perfectly round aperture. Close observation has caused them to be greatly subdivided. In the

TURBO, Lam.

The shell is round or oval, and thick; the aperture completed on the side next to the spire, by the penultimate whorl. The animal has two long tentacula, and the eyes placed on pedicles at their external base; the sides of the foot are provided with membranous wings, some times simple, at others fringed, and occasionally furnished with one or two filaments. It is to some of these that belong those petrous and thick opercula observed in cabinets, which were formerly employed in medicine under the name of *Unguis odoratus*.

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(1) Add; *Trochus indicus*, Chemn., V, clxxii, 1697—98;—*Tr. imperialis*, clxxiii, 1714, and clxxiv, 1715;—*Tr. solaris*, Ib., 1701—1702, and 1716—1717; —*Tr. planus*, Ib., 1721, 1722.

(2) *Tr. virgatus*, Chemn., V, clx, 1514—15;—*Tr. niloticus*, Chemn., V, clxvii, 1605—7, clxviii, 1614;—*Tr. vernus*, Id., clxix, 1625—26;—*Tr. inæqualis*, clxx, 1636—37;—*Tr. magnus*, clxxi, 1656—57;—*Tr. conspersus*, Gualt., lxx, B.;—*Tr. jujubinus*, clxvii, 1612—13.

(3) *Tr. maculatus*, clxviii, 1615—1616;—*Tr. costatus*, clxix, 1634;—*Tr. viridis*, clxx, 1644;—*Tr. radiatus*, Ib., 1640—42.

(4) *Tr. perspectivus*, L. Chemn., V, clxxii, 1691—96;—*Tr. stramineus*, Ib., 1699;—*Tr. variegatus*, Ib., 1708—1709;—*Tr. infundibuliformis*, Ib., 1706—1707.

(5) *Evomphalus pentangulatus*, Sowerb., Min. Conch., I, pl. xlv, f. 2;—*Ev. nodosus*, Id., xlvi, &c.

(6) This great genus constitutes the family CRICOSTOMA of Blainville.

Some of them,—MELEAGER, Montf.(1) are umbilicated, and others,—TURBO, Montf.(2), are not.

DELPHINULA, Lam.

The shell thick, as in Turbo, but convoluted in nearly the same plane; the aperture completely formed by the last whorl, and the margin not tumid; the animal similar to that of a Turbo.

The most common species, *Turbo delphinus*, L.; List., 608, 45, takes its name from the ramous and convoluted spines, which have caused it to be compared to a dried fish(3).

PLEUROTOMA, Defr.

Fossil shells with a round aperture, on the external margin of which is a narrow incision which ascends considerably; it is probable that it corresponded, like that of the Siliquariæ, to some cleft in the branchial part of the mantle.

M. Deshayes already makes upwards of twenty fossil species. The SCISSURELLÆ of M. d'Orbigny are living species of the same.

TURRITELLA, Lam.

The same round aperture as in Turbo properly so called, and completed, also, by the penultimate whorl; but the shell is thin, and is so far from being convoluted in one plane, that its spire is prolonged into a turreted obelisk. The eyes of the animal are placed on the external base of its tentacula; the foot is small(1).

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(1) *Turbo pica*, L. List., 640, 30;—*T. argyrostomus*, Chemn., V, clxxvii, 1758—61;—*T. margaritaceus*, Ib., 1762;—*T. versicolor*, List., 576, 29;—*T. mespilus*, Chemn., V, clxxvi, 1742—43;—*T. granulatus*, Ib., 44—46;—*T. ludus*, Ib., 48, 49;—*T. diadema*, Id., p. 145;—*T. cinereus*, Born., XII, 25, 26;—*T. torquatus*, Chemn., X, p. 295;—*T. undulatus*, Ib., clxix, 1640—41.

(2) *Turbo petholatus*, List., 584, 39;—*T. cochlus*, Ib., 40;—*T. chrysostomus*, Chemn., V, clxxviii, 1766;—*T. rugosus*, List., 617, 41;—*T. marmoratus*, Id., 587, 46;—*T. sarmaticus*, Chemn., V, clxxix, 1777—18, 1781;—*T. cornutus*, Ib., 1779—80;—*T. olearius*, Id., clxxviii, 1771, 72;—*T. radiatus*, Id., clxxx, 1788—89;—*T. imperialis*, Ib., 1799;—*T. coronatus*, Ib., 1791—93;—*T. canaliculatus*, Id., clxxxi, 1794;—*T. setosus*, Ib., 95—96;—*T. spinosus*, Ib., 1797;—*T. sparverius*, Ib., 1798;—*T. Moltkianus*, Ib., 99—1800;—*T. Spenglerianus*, Ib., 1801—2;—*T. castanea*, Id., clxxxii, 1807, 1814;—*T. crenulatus*, Ib., 1811—12;—*T. smaragdulus*, Ib., 1815—16;—*T. cidaris*, Chemn., V, clxxxiv;—*T. helicinus*, Born., XII, 23—24.

(3) Add; *Turbo nodulosus*, Chemn., V, clxxiv, 1723—24;—*T. carinatus*, Born., XIII, 3—4;—*Argonauta*, *cornu*, Fichtel and Moll., Test. Micros., I, a, e, or LIPISTE, Montf.

They are found in great numbers among fossils; the PROTO, Defr., should be approximated to them.

SCALARIA, Lam.

The spire, as in Turritella, elongated into a point, and the aperture, as in Delphinula, completely formed by the last whorl; it is moreover surrounded by a ridge, which is formed from space to space as the shell of the animal increases in size, resembling so many steps. The tentacula and penis of the animal are long and slender.

One species celebrated for the high price it commands(2), the *Turbo scalaris*, L.; Chemn., IV, clii, 1426, &c. vulg. *Scalata*, is distinguished by the whorls only coming in contact at the points where the ribs unite them, the intervals being open.

A second species, the *Turbo clathrus*, L.; List., 588, 50, 51, is not marked by this peculiarity; it is more slender, and very common in the Mediterranean.

Some terrestrial or fresh water subgenera, in which the aperture is entire, round, or nearly so, and operculated, may be placed here. Of this number is the

CYCLOSTOMA, Lam.(3)

The Cyclostomæ should be distinguished from all the others because they are terrestrial, as instead of branchiæ, the animal has merely a vascular network spread over the parietes of its pectoral cavity. In every other respect, however, it resembles the other animals of this family; the respiratory aperture is formed in the same way above the head by a great solution of continuity; the sexes are separated; the penis of the male is large, fleshy, and reflected into the pectoral cavity; the two tentacula are terminated by blunt tubercles, and two other tubercles, placed on their external base, support the eyes.

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(1) *Turbo imbricatus*, Martini, IV, clii, 1422;—*T. replicatus*, Ib., cli, 1412; List., 590, 55;—*T. acutangulus*, List., 591, 59;—*T. duplicatus*, Martini, IV, cli, 1414;—*T. exoletus*, List., 591, 58;—*T. terebra*, Id., 590, 54;—*T. variegatus*, Martini, IV, clii, 1423;—*T. obsoletus*, Born., XIII, 7.

(2) Enormous sums have been paid for this shell, which is the *Wentletrap* of collectors and dealers. One in Bullock's Museum, London, was valued at *two hundred guineas*, and four specimens, at one sale, brought from sixteen to twenty odd pounds sterling each. The price now is reduced, but a decent specimen is still worth several guineas. *Am. Ed.*

(3) The *Cyclostomæ* and the *Helicines* form the order of the PULMONEA OPERCULATA of M. de Férussac.

The shell is a spiral oval, with complete whorls, transversely and finely striated, and its aperture, in the adult, is surrounded with a small ridge. It is closed by a small round operculum. Found in woods, under moss, stones, &c.

The most common is the *Turbo elegans*, List., 27, 25, about six lines in length and of a greyish colour; found under all the mosses(1).

VALVATA, Mull.

The Valvatæ inhabit fresh water; their shell is convoluted in almost one plane like that of a Planorbis, but the aperture is round, and furnished with an operculum; the animal, which has two slender tentacula, with the eyes at their anterior base, respires by means of branchiæ. In a species found in France,

Valv. cristata, Mull.; Drap., I, 32, 33; Gruet-Huysen, Nov. Act. Nat. Cur. X, pl. xxxviii, the branchiæ, formed like a feather, project from under the mantle and float externally, vibrating with the breathing of the animal. On the right side of the body is a filament which resembles a third tentaculum. The foot is divided, anteriorly, into two hooked lobes. The penis of the male is slender, and reflected into the branchial cavity. The shell, which is hardly three lines broad, is greyish, flat, and umbilicated. Found in stagnant water(2).

It is here that we must place the completely aquatic shells, or those respiring by branchiæ, which belonged to the old genus HELIX; i. e., those in which the penultimate whorl forms, as in the Helices, Lymnææ, &c., a depression which gives the aperture more or less of the figure of a crescent(3).

The three first genera are still closely allied to Turbo.

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(1) Add *Turbo lincina*, List., 26, 24;—*T. labeo*, List. 25, 23;—*T. dubius*, Born., XIII, 5, 6;—*T. limbatus*, Chemn., IX, cxxiii, 1075.

We should distinguish, among the fossils, the *Cyclostoma mumia* of Lam., Brongn., Ann. du Mus., XV, xxii, 1.

(2) Add, *Valvata planorbis*, Drap., I, 34, 35;—*V. minuta*, Id., 36—38.

(3) They constitute the ELLIPSOSTOMA of M. de Blainville.

Paludina, Lam.

This genus has lately been separated from the Cyclostomæ, because there is no ridge round the aperture of the shell; because there is a a small angle to that aperture as well as to the operculum, and finally, because the animal, being provided with branchiæ, inhabits the water, like all other genera of this family. It has a very short snout and two pointed tentacula; eyes at the external base of the latter, but on no particular pedicle, and a small membranous wing on each side of the fore part of the body. The anterior edge of the foot is double, and the wing of the right side forms a little canal which introduces water into the respiratory cavity, the incipient indication of the siphon in the following family.

The common species, *Helix vivipara*, L.; Drap., I, 16, whose smooth and greenish shell is marked with two or three purple, longitudinal bands, and which abounds in stagnant waters, in France, produces living young ones: in the spring of the year they may be found in the oviduct of the female, in every stage of development. Spallanzani assures us that if the young ones be taken at the moment of birth and be reared separately, they will reproduce without fecundation, like those of the Aphis. The males, however, are nearly as common as the females; they have a large penis which protrudes and retracts, as in Helix, but through a hole pierced in the right tentaculum, a circumstance which renders that tentaculum apparently larger than the other, and which furnishes us with a mode of recognizing the male(1).

The Ocean produces some shells which only differ from the Paludinæ in being thick. They form the

Littorina, Feruss.,

Of which the common species, *Le Vigneau—Turbo littoreus*, L., Chemn. V, clxxxv, 1852, abounds on the coast of France, where it is eaten. The shell is round, brown, and longitudinally streaked with blackish. The

Monodon, Lam.

Only differs from Littorina in having a blunt and slightly salient tooth at the base of the columella, which sometimes has also a fine notch.

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(1) Add: *Cyclost. achatinum*, Drap. I, 18;—*C. impurum*, Id., 19, 20, or *Helix tentaculata*, L., &c.; and the small species of salt-water ponds described by Beudant, Ann. du Mus., XV, p. 199.

The external edge of the aperture is crenulated in several species. The animal is more highly ornamented, and is generally furnished with three or four filaments, on each side, as long as its tentacula. The eyes are planted on particular pedicles at the external base of the tentacula; the operculum is round and horny.

A small species, the *Trochus tesselatus*, L.; Adans., Seneg., XII, 1; List., 642, 33, 34, with a brown shell spotted with whitish, is very abundant on the coast of France(1).

PHASIANELLA, Lam.

An oblong or pointed shell, similar to that of several Bulimi and Lymnææ; the aperture also higher than it is wide, and furnished with a strong operculum; base of the columella sensibly flattened, but no umbilicus.

They inhabit the Indian Ocean, and are much sought for by collectors on account of the beauty of their colours. The animal is provided with two long tentacula, with eyes placed on two tubercles at their external base, and with double lips that are emarginated and fringed, as well as the wings, each of which has three filaments(2).

AMPULLARIA, Lam.

A round, ventricose shell, with a short spire, as in most of the Helices; the aperture higher than it is wide, and provided with an operculum; the columella umbilicated.

They inhabit the fresh or brackish waters of hot countries. The animal has long tentacula, and eyes placed on pedicles at their base. In the roof of the respiratory cavity, by the side of a branchial comb, according to the observations of Messrs Quoy and Gaymard, is a large pouch, without an issue, that is filled with air, and which may be considered as a natatory bladder(3).

The LANISTÆ, Montf., are Ampullariæ, with a large, spiral, convoluted umbilicus(4).

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(1) Add: *Trochus labeo*, Adans., Seneg., XII, List., 68, 442;—*Troch. Pharaonius*, List., 637, 25;—*Tr. rusticus*, Chemn., V, clxx, 1645, 46;—*Tr. nigerrimus*, Ib., 47;—*Tr. ægyptius*, Id., clxxi, 1663, 4;—*Tr. viridulus*, Ib., 1677;—*Tr. carneus*, Ib., 1682;--*Tr. albidus*, Born., XI, 19, 20;—*Tr. asper*, Chemn., Ib., clxvi, 1582;—*Tr. citrinus*, Knorr., Del., I, x, 7;—*Tr. granatum*, Chemn, V, clxx, 1654—55;—*Tr. crocatus*, Born., XII, 11, 12;—*Turbo atratus*, Chemn., V, clxxvi, 1754—55;—*Turbo dentatus*, Id, clxxviii, 1767, 8, &c.

(2) *Buccinum tritonis*, Chemn., IX, cxx, 1035, 1036;—*Helix solida*, Born., XIII, 18, 19.

(3) *Helix ampullacea*, L., List, 130;—*Bulimus urceus*, Brug, List., 125, 25.

(4) *Ampulla carinata*, Oliv., Voy. en Turq., pl. xxxi, f. 7, copied Blainv.,

HELICINA, Lam.(1)

Judging by the shell, the Helicinæ are Ampullariæ in which the margin of the aperture is reflected(2).

When this reflected margin is trenchant, they are the AMPULLINÆ, Blainv.; and when it is in an obtuse ridge, the OLYGIRÆ, Say.

There is one species which is remarkable for a border and stony traverse, on the internal face of its operculum(3).

The organs of respiration in these animals are arranged as in the Cyclostomæ, and like the latter they can live out of water(4).

MELANIA, Lam.

A thicker shell; the aperture, higher than it is wide, enlarges opposite to the spire; the columella without plicæ or umbilicus; length of the spire very various.

The Melaniæ inhabit rivers, but are not found in France, the animal has long tentacula, the eyes being on their external side, and at about the third of their length(5). The

RISSOA, Freminv.—ACMEA, Hartm.

Differs from Melania, because the two edges of the aperture unite above(6). The

MELANOPSIS, Féruss.,

Where the form is nearly that of a Melania, differs from it in a callus on the columella, and in a vestige of an emargination near the

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(1) Montfort has changed the name *Helicina* into *Pitonnilla*, but it has not been adopted, and can only be quoted as a synonyme.

(2) The *Hel. striata*, Blainv., Malac., xxxv, iv.

(3) The *Hel. neritella*, List., LXI, 59, copied Blainv., Malac., xxxix, 2.

(4) It is from this circumstance that M. de Férussac has been induced to class this subgenus with that of the *Cyclostomæ* in an order which he names the *Pulmonea Operculata*. See the Monograph of this genus by M. Gray, Zool. Journ., Nos. 1 and 2.

(5) *Mélanie thiare* (*Melania amarula*, Lam.), Chemn., Tab., 134, f. 1218 and 1219; from the Isle of France and Madagascar.

Add: *Mel. truncata*, Lam., Encyclop., pl. 458, f. 3, a—b;—*Mel. coarctata*, Id., Encyclop., pl. 458, f. 5, a—b., and a great many fossil species, among which are, *Mel. semi-placata*, Defr.;—*Mel. Cuvieri*, Desb., Coq. Foss., des environs de Paris, tome II, pl. xii, f. 1, 2;—*Mel. constellata*, Lam.

(6) M. de Freminville describes seven species in the Nouv. Bullet. des Sc. Nat. de la Soc. Phil., 1814, p. 7, and M. Audouin, three, in the Descr. de l'Eg.: *Riss. Freminvillii*, Coq., pl. iii, f. 20;—*Riss. Desmarestii*, Ib., 21;—*Riss. Orbignii*, Ib., f. 22.

bottom of the aperture, which seems to indicate a relation with the Terebræ of Brugières(1). In the

PIRENA, Lam.,

We not only find this little sinus below, but likewise a second on the opposite side(2).

These two subgenera, as well as the Melaniæ, inhabit the rivers of southern Europe and of all hot countries.

There are two genera, detached from the Volutæ, which, but that they are operculated and have but two tentacula, would resemble the Auriculæ, that we think may come here, viz.

ACTÆON, Montf.(3)—TORNATELLA, Lam.,

Where the shell is elliptical, the spire but slightly salient, the aperture lengthened into a crescent and widened below, and the base of the columella marked by one or two large plicæ or oblique callosities(4); and the

PYRAMIDELLA, Lam.

Where the spire is turreted, the aperture crescent-like and wide, and the base of the columella obliquely contorted and marked with sharp spiral plicæ(5).

JANTHINA, Lam.(6)

The form of the animal separates the Janthinæ from all the preceding genera. Their shell, however, is similar to that of the terrestrial Limaces, the columellar margin being also indented, but slightly angular at the external edge, and the columella somewhat extended beyond the half-oval, which, without this prolongation, would be formed by that edge.

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(1) *Melan. buccinoïdea*, Féruss., Mém. de la Soc. d'Hist. Nat. de Paris, tome I, pl. vii, f. 1—11, &c. See Sowerby, No. XXII.

(2) *Pir. terebralis*, Lam.; List., Tab. 115, f. 10;—*Pir. madagascariensis*, Encycl., pl. 458, f. 2, *a*, *b*, &c.

(3) Which must be carefully distinguished from the *Actæons* of Oken that appear to be allied to the *Aplysiæ*.

(4) *Voluta tornatilis*, and *bifasciata*, L., Martini, II, xliii, 442, 443;—*V. sulcata*, and *V. solidula*, Ib., 440, 441;—*V. flammea*, Ib., 439;—*V. flava*, Ib., 444;—*V. pusilla*, Ib. 446.

(5) *Trochus dolabratus*, L. Chemn., V, clxvii, 1063, 1064;—*Bulimus terebellum*, Brug., List., 844, 72.

(6) This genus forms the family of the OXYSTOMÆ, Blainv.

The animal has no operculum, but the under surface of its foot is furnished with a vesicular organ resembling a bubble of foam, but composed of a solid substance, which prevents it from crawling, but allows it to float on the surface of the water. The head, a cylindrical proboscis, terminated by a vertically cleft mouth, and armed with little hooks, has a bifurcated tentaculum on each side.

The common species, *Helix Janthina*, L.; List., 572, 24, has a pretty violet shell, and is very abundant in the Mediterranean. When the animal is touched, it diffuses a thick fluid of a deep violet colour that dyes the surrounding water.

Nerita, Lin.(1)

The columella of the Neritæ being in a straight line, renders the aperture semicircular or semi-elliptical. This aperture is generally large in comparison with the shell, but is always furnished with an operculum which completely closes it. The spire is almost effaced, and the shell semi-globular.

Natica, Lam.

Neritæ with an umbilicated shell; the animal of the species known has a large foot, simple tentacula with the eyes at their base, and a horny operculum(2).

Nerita, Lam.—Peloronta, Oken.

The umbilicus wanting; shell thick, columella dentated, and operculum stony; the eyes of the animal on pedicles by the side of the tentacula, and a moderate foot(3). The

Velata, Montf.,

Where the side of the columella is covered with a calcareous, thick and convex layer(4), is distinguished from it, but perhaps without any good reason; also the

Neritina, Lam.,

Where the shell has no umbilicus and is thin, with a horny operculum; the animal is like a true Nerita, and most generally the columella is not dentated. It inhabits fresh water.

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(1) M. de Blainville forms his family of the Hemicyclostomæ, from this genus.

(2) For the species see the first div. of Gm. and Chemn., V, pl. clxxxvi—clxxxix.

(3) For the species see the third div. of Gm. and Chemn., V, pl. clxxxx—clxxxxiii, and Sowerby, Gen. of Sh., No. XV.

(4) *Nerita perversa*, Gm., a large fossil species; Chemn., IX, cxiv, 975, 976.

A small species, very prettily coloured, abounds in the rivers of France; it is the *Nerita fluviatilis*, L.; Chemn., IX, cxxiv, 188(1).

The columella in others, however, is finely crenulated(2), and of this number there are some in which the spire is armed with long spines—Clithon, Mont.(3)

FAMILY II.

CAPULOIDA(4).

Recent researches have convinced us that it is to the Trochoida that we must approximate this family, which contains five genera, four of which are taken from the Patellæ. They all have a widely opened, scarcely turbinated shell, with neither operculum, emargination nor siphon; the animal resembles the other Pectinibranchiata and has the sexes separate. There is but one branchial comb transversely arranged on the roof of the cavity, and its filaments are frequently very long.

Capulus, Montf.—Pileopsis, Lam.

A conical shell with a recurved and spiral summit, which has long caused it to be placed among the Patellæ; the branchiæ are in one range under the anterior margin of the branchial cavity; the proboscis is long, and there is a closely plaited membranous veil under the neck; the eyes are at the external base of the conical tentacula(5). The

Hipponyx, Defr.

Would appear from the shell to be a fossil Capulus, very remarkable, however, for a bed formed of calcareous matter, on which it rests, and which probably exuded from the foot of the animal(1).

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(1) Add, *Nerita turrita*, Chemn., IX, cxxiv, 1085.

(2) *Nerita pulligera*, Chemn., loc. cit., 1878—1879;—*N. virginea*, List., 604, 606.

(3) *Nerita corona*, Chemn., 1083, 1084.

(4) M. de Blainville places most of them among his *hermaphroditical, non-symmetrical Paracephalophora;* but they all appear to me to be *diæcious.*

(5) *Patella hungarica*, List., 544—32;—*Pat. calyptra*, Chemn., X, clxix, 1643—44;—*Pat. mitrula*, Gm., List., dxliv, 31.

CREPIDULA, Lam.

The shell oval, with an obtuse horizontal point, directed obliquely backwards and laterally; the aperture forming the base of the shell, which is half closed beneath and behind by a horizontal plate. The abdominal sac which contains the viscera is on this plate, the foot beneath, and the head and branchiæ forwards. The latter consist of a range of long filaments attached under the anterior margin of the branchial cavity. The eyes are at the external base of two conical tentacula(2). The genus

PILEOLUS, Sowerby,

Appears to consist of Crepidulæ, in which the transverse plate occupies half the aperture; their shell, however, is more like that of a Patella(3). They are only found fossil.

SEPTARIA, Fér.—NAVICELLA, Lam.—CIMBER, Montf., 82.

The shell resembles a Crepidula, except that the summit is symmetrical and laid on the posterior margin, and that the horizontal plate is less salient. The animal is also provided with an additional, irregularly shaped, testaceous plate, horizontally connected with the superior surface of the muscular disk of its foot, and covered by the abdominal sac, which it partially supports. It is probably analogous to an operculum, but does not exercise its functions, being, in a measure, situated internally. The animal has long tentacula, at whose external base are pedicles which support the eyes. They inhabit the rivers of hot countries(4). In the

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(1) *Patella cornucopiæ*, Lam., Knorr., Petrif., II, part ii, pl. 131, f. 3, and Blainv., Malac.

(2) *Patella fornicata*, List. 545, 33, 35;—*P. aculeata*, Chemn., X, clxviii, 1624—25;—*P. Goreensis*, Martini, I, xiii, 131, 132;—*P. solea*, Naturf., XVIII, ii, 15;—*P. crepidula*, Adans. Seneg., I, ii, 9;—*P. porcellana*, List., 545, 34.

(3) *Pileolus plicatus*, Sowerb.;—*Pil. lævis*, Id., Genera of Shells, No. IX;—*Pil. neritoides*, Desh., Ann. des Sc. Nat., I, xiii, 3, *a*, *b*, *c*.

(4) *Patella neritoïdea*, List., 545—36, and Naturf., XIII, v, 1, 2;—*Pat. borbonica*, Bory Saint-Vincent, Voy. I, xxxvii, 2; and for the animal, Quoy and Gaym., Voy. de Freycin., pl. 71, f. 3—6.

Calyptræa, Lam.

We observe a conical shell, in the hollow of which is a little lamina that projects inwards, resembling the commencement of a columella, and that interposes itself between a fold of the abdominal sac. The branchiæ are composed of a range of numerous filaments, long and slender, like hairs.

In some of them this lamina adheres to the bottom of the cone, being itself bent into a portion of a cone or of a tube, and descending vertically(1).

In others it is almost horizontal, and adheres to the sides of the cone, which is marked above by a spiral line that establishes some relation between their shell and that of a Trochus(2).

Siphonaria, Sowerby.

The shell of the Siphonariæ, which have been recently separated from the Patellæ, at the first glance seems very similar to a flattened Patella, with radiating sulci; but its margin projects rather more on the right side, and it is excavated beneath by a slight furrow, which terminates at this prominence of the margin, to which there is a corresponding lateral hole in the mantle, for the introduction of water into the branchial cavity, placed on the back, that is closed on every other point. The respiratory organ consists of a few small lamellæ, arranged in one transverse line on the roof of that cavity; the tentacula seem to be wanting, the head being merely furnished with a narrow veil(3).

There are some species, in which even this slight appearance of the canal, in the shell, is effaced, resembling in toto that of a Patella, except in its summit, which is behind(4). In the

Sigaretus, Adans.

The shell is flattened, its aperture ample and round, and the spire very moderate, its whorls rapidly enlarging and seen within, but concealed during the life of the animal in the thickness of a fungous shield, which projects considerably beyond it, as well as the foot, and which is the true mantle. Before this mantle are an emargination and a semi-canal, which serve to conduct water into the branchial cavity, and which form the passage to the following family, but of which there are no impressions on the shell. The tentacula are conical, with the eyes at their external base; the penis of the male is very large.

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(1) *Patella equestris*, L., List., 546—38;—*Pat. sinensis*, Ib., 39;—*Pat. trochiformis*, Martini, I, xiii, 135;—*Pat. auricula*, Chemn., X, clxviii, 1628—29;—*Pat. plicata*, Nat. Forsch., XVIII, 11, 12;—*Pat. striata*, Ib., 13.

(2) *Patella contorta*, Nat. Forsch., IX, iii, 34, VIII, 11—14;—*Pat. depressa*, Ib., xviii, ii, 11.

(3) *Patella sipho*;—*Siphonaria concinna*, Sowerb., Gen. of Shells, No. XXI;—*S. exigua*, Id., Ib. See Savigny, Descr. de l'Eg., Zool. Gaster., pl. iii, f. 3, and Coq., pl. i, f. 1. Some years ago M. Gray proposed a genus Gadinia, (Philos. Magaz., April 1824) which is precisely the same as Siphonaria.

(4) *Siphonaria tristensis*, Sowerb., loc. cit.

Some species are found on the coast of France. The

Coriocella, Blainv.,

Consists of Sigareti, the shell of which is horny and almost membranous, like that of the Aplysiæ(1).

Cryptostoma, Blainv.

The shell, resembling that of a Sigaretus, with the head and abdomen, which it covers, supported by a foot four times its size, cut square behind, and forming before a fleshy, oblong bundle that constitutes nearly one-half of its mass. The animal has a flat head, two tentacula, a broad branchial pecten on the roof of its dorsal cavity, and a penis under the right tentaculum; but I can find no emargination in the mantle(2).

FAMILY III.

BUCCINOIDA.

This family has a spiral shell, in the aperture of which, near the extremity of the columella, is an emargination or a canal for transmitting the siphon or tube, which is itself but an elongated fold of the mantle. The greater or less length of the canal, when there is one, the size of the aperture, and the form of the columella, furnish the grounds of its division into genera, which may be variously grouped(1).

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(1) The *Coriocelle noire*, Blainv., Malac., XLII, f. 1. This animal is not deprived of a shell, as the author of the genus imagined, but it is thin and flexible.

(2) Besides the species in the British Museum (*Cr. Leachii*, Blainv. Malac., XLII, 3), we have one (*Cr. carolinum*, Cuv.) sent from Carolina by M. L'Herminier.

Conus, Lin.(2)

So called from the conical shape of the shell; the spire, either perfectly flat, or but slightly salient, forms the base of the cone, the apex being at the opposite extremity; the aperture is narrow, rectilinear, or nearly so, extending from one end to the other without enlargement or fold, either on its edge or on the columella. The thinness of the animal is proportioned to the narrowness of the aperture through which it issues; its tentacula and proboscis are highly protractile; the eyes are placed on the outer side of the former, and near the point; the operculum, situated obliquely on the hind part of the foot, is too narrow and short to close the whole of the aperture.

The shells of this genus, being usually ornamented with the most beautiful colours, are very common in cabinets. The seas of Europe produce very few(3).

They are distinguished by the flatness or slight projection of the spire; by the whorls being tuberculated or not; by its being more salient and even pointed, and furnished, or not, with tubercles.

There are some in which the spire is sufficiently salient to give them a cylindrical appearance, in which case it may be either smooth or tuberculated(4).

The appellation of *crowned spire* is applied to that which is studded with tubercles.

Cypræa, Lin.

The spire projecting but little, and the aperture narrow and extend-

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(1) They are the *Paracephalophora Dioica Siphonobranchiata* of Blainville.

(2) M. de Blainville unites the *Coni*, *Cypræa*, *Ovula*, *Terebella*, and the *Voluta*, in a family which he calls Angyostoma.

In placing here the genera with a straight aperture, we must not be understood as meaning to approximate them to the preceding family, but only to present them first, as possessing the most striking characters of all those which are furnished with a siphon.

(3 For the species of this beautiful genus see the article and the plates of Brugières in the Encycl. Method., where they are extremely well described and figured, and the enumeration still more complete than in the Ann. du Mus., XV, by M. de Lamarck.

(4) Species with a crowned spire: *Con. cedonulli*, L., a shell much sought for, and of which there are many varieties, Encycl. Method., pl. 316, f. 1; *Con. marmoreus*, L., Enc., pl. 317, f. 5;—*Con. arenatus*, Brug., Encycl , pl. 320, f. 6, &c.

Species with a simple spire: *Con. litteratus*, L., Encyc., pl. 323, f. 1.—*Con. tessellatus*, Brug., Enc., pl. 326, f. 7;—*Con. virgo*, Brug. Enc. pl. 326, f. 5, &c

ing from one extremity to the other; but the shell, which is protuberant in the middle, and almost equally narrowed at both ends, forms an oval, and the aperture in the adult animal is transversely wrinkled on each side. The mantle is sufficiently ample to fold over and envelope the shell, which at a certain age it covers with a layer of another colour, so that this difference, added to the form acquired by the aperture, may easily cause the adult to be taken for another species. The animal has moderate tentacula, with the eyes at their external base, and a thin foot without an operculum.

The colours of these shells, also, are extremely beautiful; they are extremely common in cabinets, though with very few exceptions they all inhabit the seas of tropical countries(1). In the

OVULA, Brug.

The shell is oval, and the aperture narrow and long, as in Cypræa, but without plicæ on the side next to the columella; the spire is concealed, and the two ends of the aperture equally emarginated, or equally prolonged in a canal. Linnæus confounded them with the Bullæ, from which Brugières has very properly separated them. The animal has a broad foot, an extended mantle which partly folds over the shell, a moderate and obtuse snout, and two long tentacula, on which, at about the third of their length, are the eyes.

Montfort particularly designates, by the term OVULÆ, those in which the external margin is transversely sulcated(2).

Those in which the two extremities of the aperture are prolonged into a canal, and in which the external margin is not sulcated, he calls NAVETTES VOLVÆ(3).

When this external margin is not sulcated, nor the extremities of the aperture prolonged, he styles them CALPURNÆ(4).

TEREBELLUM, Lam.

An oblong shell, with a narrow aperture, without plicæ or wrinkles, and increasing regularly in width to the end opposite the spire, which is more or less salient, according to the species(1). The animal is not known. The

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(1) For the species see the genus *Cypræa*, Gmel., and the figures collected by Brugières for the Encyclop., the Gen. of Shells of Sowerby, No. XVII, and particularly a Monograph by M. Gray, published in the Zool. Journal, Nos. 2, 3, and 4.

(2) *Bulla ovum*, L., List., 711, 65, Encyclop., 358, 1.

(3) *Bulla volva*, L., List., 711, 63, Encycl., 357, 3;—*B. birostris*, Encycl., 357 1; Sowerb., Ib.

4) *Bulla verrucosa*, L., List., 712, 67, Encyc., 357, 5, from which we do not separate the ULTIMÆ, Montf.: or *Bulla gibbosa*, L., List., 711, 64, Encyc., 357, 4.

VOLUTA, Lin.

Varies as to the form of the shell and that of the aperture, but is recognized by the emargination without a canal which terminates it, and by the salient and oblique plicæ of the columella. From this genus Brugières first separated the

OLIVA, Brug.,

So named from the oblong and elliptical shape of the shell, the aperture of which is narrow, long and emarginated opposite to the spire, which is short; the plicæ of the columella are numerous, and resemble striæ; the whorls are sulciform. These shells are quite as beautiful as the Cypræœ(2).

The animal has a large foot, the anterior part of which (before the head) is separated by an incision on each side; its tentacula are slender, and the eyes are on their side about the middle of their length. The proboscis, siphon and penis are tolerably long; but it has no operculum. MM. Quoy and Gaymard have observed an appendage on its posterior portion, which enters the sulcus of the whorls.

The remainder of the genus Voluta was afterwards divided into five, by M. de Lamarck(3). The

VOLVARIA, Lam.,

Closely resembles the Oliva in its oblong or cylindrical form; but the aperture is narrow, and its anterior edge ascends to the top of the spire, which is excessively short. There is one plica, or several, at the foot of the columella. The lustre and whiteness of this shell are such, that on some coasts it is used for making necklaces(4). A small fossil species is found in the vicinity of Paris(5). In the true Volutæ or the

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(1) *Terebellum subulatum*, Lam., *Bulla terebellum*, L. List., 736, f. 30, Encyc., 360, 1;—*Tereb. convolutum*, Lam., Sowerb., Gen. of Shells, No. VI.

(2) *Oliv. subulata*, Lam., Encyc., pl. 368, f. 6, *a*, *b*;—*Vol. Matula*, L.;—*Vol. porphyria*, *Vol. oliva*, and, in general, all the cylindrical Volutæ of Gm., p. 3438, et seq.

(3) Exclusive of the *Tornatellæ* and *Pyramidellæ* already mentioned.

(4) *Volv. monilis*, L.; *Volv. triticea*, Lam., &c.

(5) *Volvaria bulloïdes*, Lam., Encyc. Method., pl. 384, f. 4.

Voluta, Lam.,

The aperture is ample, and the columella marked with large plicæ, the one furthest from the spire being the largest. The degree of projection in the spire varies greatly.

In some of them, Cymbium, Montf.; Cymba, Sowerb., the last whorl is ventricose; the animal has a large, thick and fleshy foot, and a veil on the head, from the sides of which issue the tentacula. The eyes are on this same veil outside of the tentacula. The proboscis is tolerably long, and there is an appendage on each side of the base of the siphon. They attain a large size, and many of them are extremely beautiful(1).

In others, Voluta, Montf., the last whorl is conical, becoming narrower at the extremity opposite to the spire(2). The foot of the animal is not so large as that of the preceding ones; their shells are frequently remarkable for the beauty of their colours or their arrangement.

Marginella, Lam.

Form of the shell, similar to that of a true Voluta; but the external margin of the aperture is tumid; the emargination is but slightly marked. The foot of the animal, according to Adanson, is very large, and has no operculum. By turning up the lobes of its mantle it partly covers the shell. The eyes are on the external side of the base of its tentacula(3).

M. de Lamarck also distinguishes the Colombella, in which the plicæ are numerous, and the varix of the external margin is inflated in the middle(4). It appears that the operculum is wanting.

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(1) *Volv. æthiopica*, List., 797, 4;—*V. cymbium*, 796, 3, 800, 7;—*V. olla*, 794, 1;—*V. Neptuni*, 802, 8;—*V. navicula*, 795, 2;—*V. papillaris*, Seb., III, lxiv, 9;—*V. indica*, Martini, III, lxxii, 772, 773; genus Melo, Sowerb., Gen. of Shells, No. XXVIII;—*cymbiola*, Chemn., X, cxlviii; 1385, 1386;—*V. præputium*, List., 798, 1;—*V. spectibilis*, Davila, I, viii, S.

(2) *Voluta musica*, List., 805, 14, 806, 15;—*V. scapha*, 799, 6;—*V. vespertilio*, 807, 16, 808, 17;—*V. hæbrea*, 809, 18;—*V. vexillum*, Martini, III, cxx, 1098;—*V. flavicans*, Ib., xcv, 922, 923;—*V. undulata*, Lam., Ann. du Mus., &c. For the other species consult the Memoir of M. Broderip, Zool. Journ., April 1825.

(3) *Voluta glabella*, Adans., IV, genus, X, 1;—*Voluta faba*, Ib., 2;—*Vol. prunum*, Ib., 3;—*Vol. persicula*, Ib., 4, and all pl. xlii, vol. II, of Martini;—*Vol. marginata*, Born., IX, 5, 6.

(4) *Voluta mercatoria*, List., 824, 43;—*Vol. rustica*, List., 824, 44;—*Vol. mendicaria*, and nearly all plate xliv of Martini, vol. II;—*Col. strombiformis;—Vol. labiosa;—Vol. punctata*, &c., Sowerb., Gen. of Shells, No. IX.

MITRA, Lam.

The aperture oblong, with a few large plicæ on the columella, the one nearest the spire being the largest; the spire usually pointed and elongated. Several species are brilliantly spotted with red on a white ground(1). The foot of the animal is small; the tentacula are of a moderate length, with the eyes on the side, near their inferior third; the siphon also is of a moderate length, but it frequently protrudes a proboscis longer than its shell.

CANCELLARIA, Lam.

The last whorl ventricose; aperture ample and round, the internal margin forming a plate on the columella. The spire is salient and pointed, and the surface of the shell marked with decussating sulci(2). The

BUCCINUM, Lin.(3)

Comprises all the shells furnished with an emargination or a short canal inflected to the left, and in which the columella is destitute of plicæ.

Brugières has divided them into the four genera of *Buccinum*, *Purpura*, *Cassis*, and *Terebra*, part of which have been again subdivided by Messrs de Lamarck and Montfort. The

BUCCINUM, Brug.

Includes the emarginated shells without any canal, whose general form, as well as that of the aperture, is oval. The animals—all such as are known, are deprived of the veil on the head, but are furnished with a proboscis, two separated tentacula, on the external side of which are the eyes, and a horny operculum. Their siphon extends out of the shell.

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(1) Such are *Vol. episcopalis*, List., 839, 66;—*Vol. papalis*, Ib. 67; and 840, 68; —*Vol. cardinalis*, 838, 65. Add *Vol. patriarchalis*;—*Vol. pertussa*, 822, 40;—*Vol. vulpecula*, Martini, IV, cxlviii, 1366;—*Vol. plicaria*, List., 820, 37;—*Vol. sanguisuga*, List., 821, 8;—*Vol. caffra*, Martini, IV, cxlviii, 1369, 1370;—*Vol. acus*, Id., clvii, 1493, 1494;—*Vol. scabricula*, Id., cxlix, 1388, 1389;—*Vol. maculosa*, Ib., 1377;—*Vol. nodulosa*, Ib., 1385;—*Vol. spadicea*, Id., cl, 1592;—*V. aurantia*, Ib., 1393, 1394;—*V. decussata*, 1395;—*V. tunicula*, 1376.

(2) *Voluta cancellata*, L, Adans., VIII, 16;—*Vol. reticulata*, 830, 25, &c.—Sowerb., Gen. of Shells, No. V.

(3) M. de Blainville makes a family of his *Paracephalophora Dioïca Siphonobranchiata* of this great genus, which he calls the ENOTOMOSTOMA.

The name of *Buccinum* is especially applied by M. de Lamarck to those in which the columella is convex and naked, and the margin without plicæ or varix. Their foot is moderate, their proboscis long and thick, and their penis, frequently, excessively large(1). In the

Nassa, Lam.,

The side of the columella is covered by a more or less broad and thick plate, and the emargination is deep, but without a canal. The animal resembles that of a true Buccinum, and there are gradual transitions among the shells, from one subgenus to the other(2). M. Delamarck calls

Eburna, Lam.,

Those, which to a smooth shell without a plicated margin, add a widely and deeply umbricated columella. The general form of their shell is closely allied to that of the Olivæ. Their animal is unknown(3).

Ancillaria, Lam.

The same smooth shell, and at the lower part of the columella a marked lip; there is no umbilicus, neither is the spire sulcated. The animal of several species resembles that of the Olivæ, the foot being still more developed(4). The same naturalist calls

Dolium, Lam.

Those in which projecting ribs, that follow the direction of the whorls, render the margin undulated; the inferior whorl is ample and ventricose. Montfort subdivides them into

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(1) *Buccinum undulatum*, L., List., 662, 14;—*Bucc. glaciale*, L.;—*B. anglicum*, List., 963, 17;—*B. porcatum*, Martini, IV, cxxvi, 1213, 1214;—*B. lævissimum*, Id., cxxvii, 1215, 1216;—*B. igneum*, Ib., 1217;—*B. carinatum*, Phips, Voy., XII, 2;—*B. solutum*, Naturf., XVI, ii, 3, 4;—*B. strigosum*, Gm., No. 108, Bonan., III, 38;—*B. glaberrimum*, Martini, IV, cxxv, 1177, 1182;—*B. strigosum*, Ib. 1183, 1188;—*B. obtusum*, Ib., 1193;—*B. coronatum*, CXXI, 1115, 1116.

(2) *Buccinum arcularia*, List., 970, 24, 25;—*B. pullus*, List., 971, 26;—*B. gibbosulum*, List., 972, 27, and 973, 28;—*B. tessellatum*, List., 975, 30;—*B. fossile*, Martini, III, xciv, 912, 914;—*B. marginatum*, Id. cxx, 1101, 1102;—*B. reticulatum*, List., 966, 21;—*B. vulgatum*, Martini, IV, cxxiv, 162, 166;—*B. stolatum*, Ib., 1167, 1169;—*B. glans*, List., 981, 40;—*B. papillosum*, List., 969, 23;—*B. nitidulum*, Martini, IV, cxxv, 1194, 1195.

(3) *Buccinum glabratum*, List., 974, 29;—*B. spiratum*, List., 981, 41;—*B. zeylanicum*, Martini, IV, cxxii, 1119.

(4) *Ancillaria cinnamomea*, Lam., Mart., II, pl. 65, f. 731; *Voluta ampla*, Gm., Mart., Ib. f. 722, and the species described by M. de Lamarck and figured in the Encyc. Method., 393. See also the Monograph, No. 36, p. 72, of the Ancillariæ by M. W. Swainson, Journ. of the Sc. and Arts, No. 36, p. 272.

Dolium, properly so called, where the lower part of the columella is twisted(1), and into

Perdix, where it is trenchant(2).

Their animal has a very large foot, widened before; a proboscis longer than its shell, and slender tentacula, on the external side of which, and near the base, are the eyes; the head has no veil, nor has the foot an operculum.

Harpa, Lam.

The Harpæ are easily recognized by the projecting, transverse ribs on the whorls; the last of which forms a lip on the margin. The shell is beautiful, and the animal has a very large foot, pointed behind, and widened in its anterior portion, which is distinguished by two deep emarginations. The eyes are on the sides of the tentacula, and near their base. It has neither veil nor operculum(3). The

Purpura, Brug.

Is known by its flattened columella, which is trenchant near the end opposite to the spire, and which, with the external margin, forms a canal there, sunk in the shell, but not salient. The Purpuræ were scattered among the Buccina and the Murices of Linnæus. The animal resembles that of a true Buccinum(4).

The genus Licorne, Montf.,—Monoceros, Lam., consists of shells similar to the Purpuræ, but in which the external edge of the emargination is furnished with a salient spine(5).

Others, also resembling the Purpuræ, in which the columella or at least the margin is provided, in the adult, with teeth which narrow the aperture, form the Sistra, Montf., or the Ricinula, Lam.(1)

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(1) *Buc. olearium*, List., 985, 44, and Sowerb., Gen. of Shells, No. 29;—*B. galea*, List. 898, 18;—*B. dolium*, List., 899, 19;—*B. fasciatum*, Brug., Mart., III, cxviii, 1081;—*B. pomum*, Id., II, xxxvi, 370, 371.

(2) *Bucc. perdix*, List., 984, 43.

(3) *Buccinum harpa*, L., and the other species long confounded with it—List., 992, 993, 994; Mart., III, cxix; *Bucc. costatum*, Ib. Messrs Reynaud, Quoy and Gaymard have observed, that, under certain circumstances, the posterior part of the foot is spontaneously detached.

(4) *Buccinum persicum*, List., 987, 46, 47;—*B. patulum*, Id., 989, 49;—*B. hæmastoma*, Id., 988, 48;—*B. trochlea*, *B. lapillus*, Id., 965, 18, 19;—*Murex fucus*, Id. 990, 50;—*Mur. histrix*, Martini, III, ci, 974, 975;—*Mur. mancinella*, List., 956, 7, 8, 957, 9—10;—*Mur. hippocastanum*, List., 955, 996, 990, 991.

(5) *Buccinum monodon*, Gm., Martini, III, lxix, 761;—*Bucc. narval*, Brug.;—*B. unicorne*, Id.

Concholepas, Lam.

The general characters of the Purpuræ, but the aperture is so enormous, and the spire so small, that the shell has almost the appearance of a Capulus, or one of the valves of an Arca; a small salient tooth is visible on each side of the emargination. The animal resembles that of a true Buccinum, with the exception of its foot, which is enormous in width and thickness, and that it is attached to the shell by a muscle shaped like a horse-shoe, as in the Capuli; it has a thin, narrow, and horny operculum.

But a single species is known, the *Buccinum concholepas*, Brug.; Argenv., pl. ii, f. F, D; and Sowerb., Gen. of Shells, No. VI. From the coast of Peru.

Cassis, Brug.

The shell oval; aperture oblong or narrow; the columella covered with a plate as in Nassa, and that plate transversely plicated, as well as the external margin; the emargination terminating in a short canal, that is reflected and pushed back, as it were, to the left: varices are frequently observed on it. The animal resembles that of a true Buccinum, but its horny operculum is denticulated, in order to pass between the plicæ of the external margin.

In some, the lip of the margin is denticulated externally near the emargination(2).

In others it is entire(3). The

Morio, Montf.—Cassidaria, Lam.

Was separated from Cassis by Montfort. The canal curves less suddenly, and the whole shell leads directly to certain Murices. The animal resembles that of a Buccinum, but its foot is more developed(4).

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(1) *Murex ricinus*, L., Seb., III, lx, 37, 39, 42;—*Mur. neritoïdeus*, Gm., No. 43, List., 804, 12—13.

(2) *Buccinum vibex*, Martini, II, xxxv, 364, 365;—*B. glaucum*, List., 996, 60;—*B. erinaceus*, List., 1015, 73.

(3) The *Buccinum* of the second division of Gmelin, except the *B. echinophorum*, *strigosum*, No. 26, and *tyrrhenum*, which are Cassidariæ. It must also be recollected, that, among the true Cassides, Gmelin appears to have several repetitions.

(4) *Buccinum caudatum*, L., List., 940, 36;—*B. echiniphorum*, List., 1003, 68;—*B. strigosum*, Gm., No. 26, List., 1011, 71, f.;—*Bucc. tyrrhenum*, Bonam., III, 160.

Terebra, Brug.

The aperture, emargination and columella of a true Buccinum; but the general form is turriculated, that is to say, the spire is lengthened into a point(1). In the

Cerithium, Brug.,

Very properly separated from the **Murex** of Linnæus, we observe a shell with a turriculated spire; the aperture is oval, and the canal short, but well marked, and reflected to the left or backwards. The animal has a veil on its head, and is furnished with two separated tentacula, on the side of which are the eyes, and with a round, horny operculum.

Many are found fossil(2). M. Brongniart separates from the Cerithia the

Potamida, Brongn.

Which, with the same form of shell, has a very short and scarcely emarginated canal, no sulcus on the upper part of the right margin, and the external lip dilated. The Potamidæ inhabit rivers, or at least their mouths, and fossil specimens are found in strata, which contain other fresh-water or land species only(3). The genus

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(1) The whole of the last subdivision of the Buccina, Gmelin, such as, *Buccinum maculatum*, L., 846, 74;—*Bucc. crenulatum*, L. List., 846, 75;—*Bucc. dimidiatum*, L., List., 843, 71:—*Bucc. subulatum*, L., List., 842, 70, &c.

M. de Blainville separates from them the genus Subula, which he founds on a difference in the animal, and moreover on the presence of an operculum.

(2) *Murex vertagus*, List., 1020, 83;—*M. aluco*, List., 1025, 87;—*M. annularis*, Martini, IV, clvii, 1486;—*M. cingulatus*, Ib., 1492;—*M. terebella*, Id., clv, 1458, 9;—*M. fuscatus*, Gualt., 56, H;—*M. granulatus*, Martini, IV, clvii, 1483;—*M. moluccanus*, Ib., 1484, 8. &c., with the numerous fossil species described by M. de Lamarck, Ann. du Mus. M. Deshayes has separated from the Cerithia, under the name of Nevinea, some small species, where the margin is prolonged into the aperture, and divides it into three distinct orifices.

It is also near the Cerithia that we must place several fossil shells, which form the genus Nerinea of M. Defrance, and which is distinguished by strongly marked plicæ on each whorl and on the columella, the centre of which, besides, is hollow throughout Nine species are already ascertained.

(3) See Brongn., Ann. du Mus., XV, 367. In this subgenus should be placed the *Cerithium atrum*, Brug., List., pl. 115, f. 10;—*Cer. palustre*, f. Ib., 836, f. 62:—*C. muricatum*, Ib., 121, f. 17, &c., and among the fossils, the *Potamida Lamarkii*, Brongn., loc. cit. pl. xxii, f. 3.

MUREX, Lin.(1)

Comprises all those shells in which there is a salient and straight canal(2). The animal of each subgenus is furnished with a proboscis, long approximated tentacula on the external side of which are the eyes, and with a horny operculum; the veil on the head is wanting; and, the length of the siphon excepted, it otherwise resembles that of the Buccina. Brugière divides them into genera, which have been since subdivided by Messrs Lamarck and Montfort. The

MUREX, Brug.

Includes all those which have a salient and straight canal, with varices across the whorls(3).

Lamarck appropriates this name to those in which the varices are not contiguous on two opposite lines.

If their canal be long and slender, and the varices armed with spines, they become the MUREX, properly so called, of Montfort(4).

When, with this long canal, the varices are mere knobs, they form the BRONTIS, Montf.(5)

Some of them, which, with a moderate canal, have projecting tubes that penetrate into the shell between spiny varices, constitute the TYPHIS, Montf.(6)

When, instead of spines, the varices are furnished with plicated lamellæ, slashed, or divided into branches, they are the CHICORACEA, Montf.(7) Their canal is long and moderate, and their foliaceous productions vary infinitely in figure and complication.

When, with a moderate or short canal, the varices are mere knots, and the base is provided with an umbilicus, they form the Aquilla, Montf. Several species inhabit the coast of France(1).

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(1) This great genus forms the family SIPHONOSTOMA, Blainv.

(2) To which Linnæus also added several *Purpuræ* in which the canal is not salient, and all the *Cerithia* in which it is recurved.

(3) Varices are knobs with which the animal borders its mouth, at each interruption in the growth of its shell.

(4) *Murex tribulus*, List., 902, 22;—*Mur. brandaris*, List., 900, 20;—*Mur. cornutus*, List., 901, 21;—*Mur. senegalensis*, Gm., and the *costatus* of No. 86, Adans. Seneg., VIII, 19.

(5) *Murex haustellum*, List., 903, 23;—*Mur. caudatus*, Martini, Conch., III, f. 1046, 1049;—*Mur. pyrum.*

(6) *Murex tubifer*, Roissy, Brug., Journ. d'Hist. Nat., I, xi, 3: Montfort, 614

(7) *Murex ramosus*, List., 946, 41, and all its varieties; Martini, III, cv, cx, cxi;—*Mur. scorpio*, Martini, cvi;—*Mur. saxatilis*, Martini, cvii, cviii, and several others not yet well characterized.

If the umbilicus be wanting, they are his Lotorium(2).

Finally, when the canal is short, the spire elevated, and the varices simple, they are his Tritonium. Their mouth is usually plicated transversely on both margins. Very large ones inhabit the seas of Europe(3).

The varices are sometimes numerous, compressed, and almost membranous, constituting the Trophona, Montf.(4)

At other times, they are compressed, very salient, and but few in number(5).

M. de Lamarck separates from all the Murices of Brugière, the

Ranella, Lam.,

Characterized by opposing varices, so that the shell is bordered with them on both sides. Their canal is short, and their surface studded with mere tubercles; margins of the aperture plicated(6).

The Apolles, Montf., are merely umbilicated Ranellæ(7). The

Fusus, Brug.

Comprises all shells with a salient and straight canal, which are destitute of varices.

When the spire projects, the columella is without plicæ, and the margin is entire, they are the Fusus properly so called, Lam., which Montfort again subdivides; when they have no umbilicus, they are his Fusus(8). The shortest and most ventricose gradually approach the form of the Buccina(1). When provided with an umbilicus they are his Lathira(2).

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(1) *Murex cutaceus*, L., Seb., III, xlix, 63, 64;—*Mur. trunculus*, Martini, III. cix, 1018, 20;—*Mur. miliaris*, Id., iii, Vign., 6, 1—5;—*Mur. pomum*, Adans., IX, 22;—*Mur. decussatus*, Ib., 21.

(2) *Mur. lotorium*, L., Martini, IV, cxxx, 1246—9;—*Mur. femorale*, Id., cxi, 1039;—*Mur. triqueter*, Born., XI, 1, 2.

(3) *Mur. tritonis*, L., List., 959, 12;—*Mur. maculosus*, Martini, IV, cxxxii, 1257, 1258;—*Mur. australis*, Lam., Martini, IV, cxxxvi, 1284;—*Mur. pileare*, Martini, IV, cxxx, 1243, 48, 49;—*Mur. argus*, Martini, IV, cxxxi, 1255, 1256;—*Mur. rubicula*, Id., cxxxii, 1259, 1267.

(4) *Mur. magellanicus*, Martini, IV, cxxxix, 1297.

(5) *Mur. tripterus*, Born., X, 18, 19;—*Mur. obeliscus*, Martini, III, cxi, 1033, 1037.

(6) N.B. They are the *Mur. bufo*, Montf., 574;—*Mur. rana*, List., 995, 28;—*Mur. reticularis*, List., 935, 30;—*Mur. affinis*, and the species or varieties of Martini, 1229, 30, 31, 32, 33, 34, and 1269, 70, 71, 72, 73, 74, 75, 76.

(7) *Murex gyrinus*, List., 939, 34.

(8) *Mur. cochlidium*, Seb. III, lii, 6;—*Mur. morio*, List., 928, 22;—*Mur. canali-*

The Struthiolariæ are distinguished from the true Fusi by a border which surrounds their aperture, and which covers the columella. The margin of the adult is inflated, which connects them with Murex(3).

When the spire is salient, the columella without plicæ, and there is a small indentation or well marked emargination of the margin near the spine, they are the Pleurotoma, Lam.(4)

The Clavatulæ, in which the emargination is wide and reaches to the spire, are also properly distinguished.

When the spire is but slightly marked, flattened or rounded, and the columella is without plicæ, they are the Pyrula, Lam. Some are umbilicated(5), and others not(6).

From these Pyrulæ, Montfort again separates the species with a flattened spire, internally striated near the lip, by the name of Fulgur(7). They are a sort of Pyrulæ with a plicated columella, the plicæ being sometimes almost insensible.

Among these divisions of the Fusi of Brugières, the Fasciolariæ, Lam., are distinguished by some oblique and well marked plicæ on the columella, near the origin of the siphon(8). The

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culatus, Martini, III, lxvii, 742, 743;—*Mur. candidus*, Martini, IV, cxliv, 1339;—*Mur. ansatus*, Id. Ib., 1340;—*Mur. lævigatus*, Martini, cxli, 1319, 1320;—*Mur. longissimus*, Ib., 1344;—*Mur. undatus*, Ib., 1343;—*Mur. colus*, L., List., 917, 10;—*Mur. striatulus*, Ib., 1351, 1352;—*Mur. pusio*, List., 914, 7;—*Mur. verrucosus*, Ib., 1349, 1350, &c., and the numerous fossil species described by M. de Lamarck.

(1) *Mur. islandicus*, Martini, IV, cxli, 1312, 1313, &c.;—*Mur. antiquus*, Ib., cxxxviii, 1294, and List., 962, 15;—*Mur. despectus*, Martini, 1295.

(2) *Mur. vespertilio*, Id., cxlii, 1323, 24.

(3) *Mur. stramineus*, Gm., Encyc. Method., 431, 1, *a*, *b*;—*Struthiolaria crenulata*, Lam.

(4) *Mur. babilonius*, L., List., 917, 11;—*Mur. javanus*, Martini, IV, 158, and the immense number of fossil species described by Lamarck and other conchyliologists.

(5) *Mur. rapa*, Martini, III, lxviii, 750, 753;—*Buccinum bezoar*, Gm., Martini, III, lxviii, 754, 755.

(6) *Bulla ficus*, L., List., 750, 46;—*Murex ficus*, Ib., 741.

(7) *Murex perversus*, L., List., 907, 27;—*Mur. aruanus*, List., 908, 28;—*Mur. canaliculatus*, Martini, III, lxvi, 738, 740, and lxvii, 742, 3;—*Mur. spirillus*, Martini, III, cxv, 1069;—*Pyrula canaliculata*, Lam., Montf., 502, which appears to me the same as the *Mur. carica*, Martini, III, lxvii, 744.

(8) *Mur. tulipa*, L., List., 910, 911;—*Mur. trapezium*, List., 93, 26;—*Mur. polygonus*, List., 922, 15;—*Mur. infundibulum*, List., 921, 14;—*Mur. striatulus*, Martini, IV, cxlvi, 1351, 1352;—*Mur. versicolor*, Ib., 1348;—*Mur. pardalis*, Id. cxlix, 1384;—*Mur. costatus*, Knorr., Petrif., C, *n*. 7;—*Mur. lancea*, Martini, IV, cxlv, 1347.

TURBINELLA, Lam.,

Also consists of shells with a straight canal, but without varices, distinguishable by the large transverse plicæ on their columella, which extend the whole length of the aperture, and which closely approximate them to the conical Volutæ; they only differ from the latter in the elongation of their aperture into a sort of canal(1); the line that separates them is not easily traced. The genus

STROMBUS, Lin.,

Includes those shells with a canal that is either straight or inflected towards the right, of which the external margin of the aperture dilates with age, but still preserves a sinus near the canal, under which passes the head of the animal, when it extends itself.

In most of them the sinus is at some distance from the canal. They are subdivided by M. de Lamarck into two subgenera. The

STROMBUS, Lam.

In which the margin expands into a wing of more or less extent, but not digitated. The foot is proportionably small, and the eyes are supported by lateral pedicles of the tentacula, thicker than the tentacula themselves. The operculum is horny, long and narrow, and placed on a thin tail(2). In the

PTEROCERA, Lam.

The margin, in the adult, is divided into long and slender digitations, varying in number, according to the species. The animal is the same as that of the true Strombus(3).

In other Strombi, the sinus of the external margin is contiguous to the canal, forming the ROSTELLARIA, Lam. There is usually a second canal ascending the spire, formed by the external margin and by a continuation of the columella.

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(1) *Mur. scolymus*, Martini, IV, cxlii, 1325;—*Voluta pyrum*, Martini, III, xcv, 916, 917;—*Voluta ceramica*, List., 829, 51;—*Voluta rhinoceros*, Chemn., X, 150, f. 1407, 1408;—*Voluta turbinellus*, List., 311, 20;—*Vol. capitellum*, List., 810, 19;—*Vol. globulus*, Chem., XI, 178, f., 1715;—*Vol. turrita*, Gm.

(2) Nearly all the Strombi comprised in the second and third division of Gmelin, observing, that owing to the various degrees of development acquired by the external margin, there are several repetitions.

(3) *Strombus lambis*, Rondel., 79; Martini, III, lxxxvi, 855;—*Str. chiragra*, List., 870;—*Str. millepeda*, List., 868, 869;—*Str. scorpius*, List., 867.

In some of them, the margin is still digitated. Their animal resembles that of a Murex, but has only a very small operculum(1).

In others, we merely observe a dentated margin. Their canal is long and straight(2).

In some again, that margin is entire; they are the HIPPOCRENES, Montf.(3)

ORDER VII.

TUBULIBRANCHIATA.

The Tubulibranchiata should be detached from the Pectinibranchiata, with which they are very closely allied, because the shell, which resembles a more or less irregularly shaped tube, only spiral at the commencement, attaches itself to various bodies; they consequently are deprived of copulating organs, and fecundate themselves. In the

VERMETUS, Adans.,

We remark a tubular shell whose whorls, at an early age, still form a kind of spire, but then continue on in a tube more or less irregularly contorted, or bent like the tubes of a Serpula. This shell usually attaches itself by interlacing with others of the same species, or is partly enveloped by Lithophytes: the animal, having no power of locomotion, is deprived of a foot, properly so called; but the part which in ordinary Gasteropoda forms the tail, is here turned under it, and extends to beyond the head, where its extremity becomes inflated and furnished with a thin operculum; when the animal withdraws into its shell, it is this mass which closes the entrance; it is sometimes seen with various appendages, and in certain species, the operculum is spiny. The head of the animal is obtuse, and has two moderate tentacula, on the external sides of which, at the base, are the eyes. The mouth is a vertical orifice, beneath which is a filament on each side, that has all the appearance of a tentaculum, but belonging in reality to the foot. The branchiæ form but a single range along the left side of the roof of the branchial cavity. The right side is occupied by the rectum and the spermatic canal, which also transmits the ova. There is no penis, the animal fecundating itself.

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(1) *Strombus pes pelecani*, L., List., 865, 866.

(2) *Strombus fusus*, L., List., 854, 11, 12, 916, 9.

(3) *Strombus amplus*, Brander., Foss., Hant., VI, 76, or *Rostellaria macroptera*, Lam.; *Str. fissurella*, Lam., Encycl. Method., p. 411, 3, *a*, *b*, which is not that of Martini, IV, clviii, 1498, 1499, &c.

The species are numerous, but not very distinct. Linnæus left them among the Serpulæ(1).

The VERMILIÆ, also left by M. de Lamarck near the Serpulæ, are similar to the Vermeti(2).

MAGILUS, Montf.,

The Magili have a longitudinally carinated tube, which is at first regularly spiral, and then extends itself in a line more or less straight; although the animal is unknown, it is highly probable that it should be placed near the Vermeti(3). The

SILIQUARIA, Brug.

Resembles Vermetus in the head, the position of the operculum, and in the tubular and irregular shell; but there is a fissure on the whole length of this shell which follows its contour, and which corresponds to a similar cleft in that part of the mantle which covers the branchial cavity. Along the whole side of this cleft is a branchial comb, composed of numerous, loose and tabular-like lamellæ. Linnæus left them with the Serpulæ, and till very lately they were considered as belonging to the class of the Annelides(4).

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(1) *Serpula lumbricalis*, L., Adans., Senegal, XI, 1, and several new species.

(2) *Serpula triquetra*, Gm., Born., Mus., pl. xviii, *f.* 14.

(3) *Magilus antiquus*, Montf., II, pl. 43, and Guettard, Mém., III, pl. lxxi, f. 6.

(4) *Serpula anguina*, L.;—*Serpula muricata*, Born., Mus., XVIII, 16.

N.B. M. de Lamarck considered the Siliquariæ and the Vermiliæ as neighbours of the Serpulæ. M. de Blainville has approximated them to the Vermeti. M. Audouin has lately observed and described the animal, and to him do we owe what is stated above.

ORDER VIII.

SCUTIBRANCHIATA(1).

The Scutibranchiata comprise a certain number of Gasteropoda, similar to the Pectinibranchiata, in the form and position of the branchiæ, as well as in the general form of the body, but in which the sexes are united, in such a way, however, as to allow them to fecundate themselves. Their shells are very open, without an operculum, and most of them without the slightest turbination, so that they cover these animals, and particularly their branchiæ, in the manner of a shield. The heart is traversed by the rectum, and receives the blood from two auricles, as is the case in the greater number of bivalves. The

HALYOTIS, Lin.(2)

Is the only genus of this order in which the shell is turbinated; it is distinguished from that kind of shell by the excessive amplitude of the aperture, and the flatness and smallness of the spire, which is seen from within. This form has caused it to be compared to the ear of a quadruped. In the

HALYOTIS, Lam.,

Or the true Halyotes, the shell is perforated along the side of the columella by a series of holes; when the last hole is not terminated, it gives to that part the look of an emargination. The animal is one of the most highly ornamented of all the Gasteropoda. A double membrane, cut into leaves and furnished with a double range of filaments, extends, at least in the most common species, round the foot and on to the mouth; outside its long tentacula, are two cylindrical pedicles which support the eyes. The mantle is deeply cleft on the right side, and the water, which passes through the shell, penetrates through it into the branchial cavity; along its edges we observe three or four filaments which the animal can protrude through these holes. The mouth is a short proboscis(1).

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(1) M. de Blainville unites this order and the following one (the Chitones excepted) in his sub-class of the PARACEPHALOPHORA HERMAPHRODITA.

(2) The PARACEPHALOPH. HERMAPH. OTID., Blainv.

The PADOLLÆ, Montf., have an almost circular shell, in which the holes are nearly obliterated, and there is a deep sulcus that follows the middle of the whorls, and is marked externally by a salient ridge; *Padole briqueté*, Montf., II, p. 114.

STROMATIA, Lam.

The shell more hollow, the spire more salient, and the holes wanting; otherwise resembling that of the Halyotides, which it thus connects with certain species of Turbo. The animal is much less ornamented than that of the Halyotides(2).

In the following genera, which are separated from the Patellæ, the shell is perfectly symmetrical, as well as the position of the heart and branchiæ(3). In the

FISSURELLA, Lam.,

We perceive a broad fleshy disk under the belly, as in the Patellæ, a conical shell placed on the middle of the back, but not always completely covering it, and perforated at its summit by a small orifice, which affords at once an issue for the feces and a passage to the water, required for respiration; this orifice penetrates into the cavity of the branchiæ, situated on the fore part of the back, and in the bottom of which terminates the anus; a cavity otherwise widely opened above the head. A branchial comb is symmetrically arranged on each side; the eyes are on the external base of the conical tentacula, and the sides of the foot are furnished with a range of filaments(4).

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(1) All the HALYOTIDES, Gm., except the *imperforata* and the *perversa*.

This genus, although it has been denied, most certainly has its counterpart among the fossils. M. Marcel de Serres has described a species found in the calcareous strata of Montpellier (*Hal. Philberti*), Ann. des Sc. Nat. tome XII, pl. xlv, f. A.

(2) *Halyotis imperforata*, Gm., Chemn., X, clxvi, 1690, 1691.

(3) They are the PARACEPHALOPHORA CERVICO-BRANCHIATA, BRANCHIFERA, Blainv.

(4) All the Patellæ of the fifth division of Gmelin, except *Pat. fissura*; among others, *Pat. græca*, List., 527, 1, 2;—*P. nimbosa*, List., 528, 1. We have a species in which the shell, at least six times the size of the mantle, simply surrounds the hole of the summit like a ring,—*Fissurella annulata*, Cuv

EMARGINULA, Lam.

The structure of the Emarginulæ is similar to that of a Fissurella, except that instead of the hole in the summit, there is a small cleft or emargination in the anterior margin of their mantle and shell, which also penetrates to the branchial cavity; the margin of the mantle envelopes and covers a great part of that of the shell; the eyes are placed on a tubercle of the external base of the conical tentacula, and the margin of the foot is furnished with a range of filaments(1).

PARMOPHORUS, Lam.

A great portion of the shell curved by the reflected margin of the mantle, as in the Emarginulæ; the shell itself oblong, slightly conical, and without hole or emargination; the branchiæ and other organs, as in the preceding genera(2).

ORDER IX.

CYCLOBRANCHIATA(3).

The branchiæ of the Cyclobranchiata resemble small lamellæ, or little pyramids forming a cordon more or less complete under the borders of the mantle, very nearly as in the Inferobranchiata, from which they are distinguished by the nature of their hermaphroditism; for, like the preceding genus, they have no copulating organ, but fecundate themselves. Their heart does not embrace the rectum, but varies as to situation. But two genera of this order are known, in both of which the shell never approaches in the least to the turbinated form.

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(1) *Patella fissura*, L., List., 543, 28, &c. The PALMARIA, Montf., must be allied to this genus.

(2) *Patella ambigua*, Chemn., CXCII, 1918.

N.B. *Fissurellæ*, *Emarginulæ*, and *Parmaphori* are also found fossil.

(3) M. de Blainville, who calls the order in which he places *Doris* CYCLOBRANCHIATA, makes an order of the Patellæ, and of the three preceding genera, which he names CERVICOBRANCHIATA, which he divides into the *Retifera* and the *Branchifera*. The *Retifera* are the *Patellæ*, because he supposes that they respire through the medium of a network in the cavity which is over their head. I have vainly sought for it, however, nor could I discover there any other organ of respiration than the cordon of lamellæ which extends round the under part of the margin of the mantle. See Anat. of the Patella in my Mém. on the Mollusca.

PATELLA, Lin.

The entire body covered with a shell, formed of a single piece, in the form of a broad-based cone; a cordon of little branchial lamellæ under the margin of the mantle; the anus and genital orifices somewhat to the right and above the head, which is furnished with a thick and short snout, and two pointed tentacula, on the external base of which are the eyes; the mouth is fleshy, and containing a spiny tongue, which inclines backwards, and is reflected deeply in the interior of the body. The stomach is membranous, and the intestine long, thin, and greatly flexed; the heart is forwards, above the neck, and a little to the left(1).

Some species abound on the coast of France.

CHITON, Lin.

A range of testaceous and symmetrical scales along the back of the mantle, but not occupying its whole breadth; edges of the mantle coriaceous, and furnished either with a naked skin or little scales, which give it the appearance of shagreen, or with spines, hairs, or setaceous fasciculi. Under these edges, on each side, is a range of lamellar, pyramidal branchiæ; and before, a membranous veil on the mouth supplies the want of tentacula. The anus is under the posterior extremity. The heart is situated behind, on the rectum; the stomach is membranous, and the intestine very long and greatly contorted. The ovary is situated over the other viscera, and appears to open on the sides by two oviducts.

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(1) I separate from the PATELLÆ and arrange among the TROCHOIDA, all the animals comprised in the genera, CREPIDULA, NAVICELLA, CALYPTRÆA of M. de Lamarck, to which I add the CAPULI; and his genera FISSURELLA, EMARGINULA, and PARMOPHORA, or *Patella ambigua*, Chemn., XI, 197, 1918, I place among the SCUTIBRANCHIATA. The UMBRELLA, *Scutus*, Montf.,—*Patella umbrella*, Martini, II, vi, 18, is one of the TECTIBRANCHIATA. The *Pat. anomala*, Müll., belongs to the BRACHIOPODA and is my genus ORBICULUS. The other species quoted by Gm. remain in the genus Patella.

A few small species are found on the coast of France; very large ones abound in the seas of hot climates(1).

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(1) The Chitonelli of Lamarck, and all the species of Chiton of authors, should be left in this genus, of which M. de Blainville has thought proper to make a separate class, called Polyplaxiphora, supposing that it leads to the Articulated Animals.

CLASS IV.

ACEPHALA.

The Acephala have no apparent head; but a mere mouth concealed in the bottom, or between the folds of their mantle. The latter is almost always doubled in two, and encloses the body as a book is clasped by its cover; but it frequently happens, that, in consequence of the two lobes uniting before, it forms a tube; sometimes it is closed at one end, and then it represents a sac. This mantle is generally provided with a calcareous bivalve, and sometimes multivalve shell, and in two genera only is it reduced to a cartilaginous, or even membranous nature. The brain is over the mouth, where we also find one or two other ganglia. The branchiæ usually consist of large lamellæ covered with vascular meshes, under or between which passes the water; they are more simple, however, in the genera without a shell. From these branchiæ the blood proceeds to a heart, generally unique, which distributes it throughout the system, returning to the pulmonary artery without the aid of another ventricle.

The mouth is always edentated, and can only receive the molecules brought to it by the water: it leads to a first stomach, to which there is sometimes added a second; the length of the intestines is extremely various. The bile is thrown by several pores into the stomach, which is surrounded by the mass of the liver.

All these animals fecundate themselves, and in several species, the young ones, which are innumerable, pass some time in the thickness of the branchiæ previously to being brought to light(1). All the Acephala are aquatic(2).

ORDER I.

ACEPHALA TESTACEA.

Testaceous Acephala, or Acephala *with four branchial leaflets*(3), are beyond all comparison the most numerous. All the bivalves, and some genera of the multivalves belong to this order. Their body, which contains the liver and viscera, is placed between the two laminæ of the mantle; forwards, and still between these laminæ are the four branchial leaflets, transversely and regularly striated by the vessels: the mouth is at one extremity, the anus at the other, and the heart towards the back; the foot, when it exists, is inserted between the four branchiæ. On the sides of the mouth are four triangular leaflets, which are the extremities of the two lips, and serve as tentacula. The foot is a mere fleshy mass, the motions of which are effected by a mechanism analogous to that which acts on the tongue of the Mammalia. Its muscles are attached to the bottom of the valves of the shell. Other muscles, which sometimes form one mass and sometimes two, cross transversely from one valve to the other to keep them closed, but when the animal relaxes these muscles, an elastic ligament placed behind the hinge opens the valves by its contraction.

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(1) Some naturalists are of the opinion that the very minute bivalves, which in certain seasons fill the external branchiæ of the *Anodontes* and *Mytilus*, are not the progeny of those Mollusca, but a different and parasitic species. See, on this subject, the Dissertation of M. Jacobsen. The difficulty seems to be removed by the observations of Sir Ev. Home.

(2) M. de Lamarck at first changed my name of *Acephala* into that of *Acephalata*. M. de Blainville forms a class, which he calls ACEPHALOPHORA, from my *Acephala* and my *Brachiopoda*.

(3) M. de Lamarck, in his last work, has made his class of the CONCHIFERA from my *Testaceous Acephala;* and M. de Blainville has converted the same into his order of the ACEPHALOPHORA LAMELLIBRANCHIATA: but it is always the same thing.

A considerable number of bivalves are provided with what is termed a *byssus*, or a fasciculus of threads more or less loosely connected, which issues from the base of the foot, and by which the animal adheres to various bodies. It uses its foot to direct the threads and to agglutinate their extremities; it even reproduces them when cut, but the nature of the production is not thoroughly ascertained. Reaumur considered these threads as a secretion, spun and drawn from the sulcus of the foot; Poli thinks they are mere prolongations of tendinous fibres.

The shell essentially consists of two pieces, called valves, to which in certain genera are added others, connected by a hinge that is sometimes simple and sometimes composed of a greater or smaller number of teeth and plates, which are received into corresponding cavities.

There is usually a projecting part near the hinge called the *summit* or *nates*.

Most of these shells fit closely when the animal approximates them, but there are several which exhibit gaping portions either before or at the extremities.

FAMILY I.

OSTRACEA.

The mantle is open, without tubes or any particular aperture.

The foot is either wanting in these Mollusca or is small: they are mostly fixed by the shell or byssus to rocks and other submerged bodies. Those which are free, seldom move except by acting on the water by suddenly closing their valves.

In the first subdivision there is nothing but a muscular mass reaching from one valve to the other, as seen by the single impression left upon the shell.

It is thought proper to class with them certain fossil shells.

the valves of which do not even appear to have been held together by a ligament, but which covered each other like a vase and its cover, and were connected by muscles only. They form the genus

ACARDA, Brug.—OSTRACITA, La Peyr.,

Of which M. de Lamarck makes a family that he names RUDISTA. The shells are thick, and of a solid or porous tissue. They are now divided into the

RADIOLITES, Lam.,

In which the valves are striated from the centre to the circumference. The one is flat, the other thick, nearly conical and fixed(1).

SPHÆRULITES, Lameth.,

Where the valves are roughened by irregularly raised plates. It is also thought we may add the

CALCEOLA,

One valve of which is conical but free, and the other flat and even somewhat concave, so that they remind us of a shoe; and even the

HIPPURITES,

Where one valve is conical or cylindrical with two obtuse, longitudinal ridges on the inside; the base even appears to be divided into several cells by transverse septa(2); the other valve fits like a cover. The

BATOLITHES, Montf. 334,

Are cylindrical and straight Hippurites; they are frequently found greatly elongated. There is much incertitude however with respect to all these bodies(1).

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(1) The species of Brugière, 173, f. 1, 23, which forms the genus ACARDA, Lam., appears to be nothing more than a double epiphysis of the vertebra of some cetaceous animal. The DISCINÆ, Lam., are Orbiculæ; it is also thought that his Craniæ should be approximated to them. The JODAMIES of M. de France or BIROSTRITES, Lam., are mere moulds of SPHŒRULITES or at least of the bodies always found in their interior, although they do not adapt themselves to their form. See M. Charles Desmoulins on the *Spherulites*.

(2) See Deshayes, Ann. des Sc. Nat., June, 1825; and Ch. Desmoulins, loc. cit. Several Hippurites have been described by La Peyrouse under the improper name of *Orthoceratites*. The *Cornucopiæ* of Thompson, Journ. de Phys. an. X, pl. ii, is also one of them.

As to the well known living testaceous Acephala, Linnæus had united in the genus

Ostrea, Lin.,

All those which have but a small ligament at the hinge, inserted into a little depression on each side, and without teeth or projecting plates.

Ostrea, Brug.

The true Oysters have the ligament as just described, and irregular inequivalve and lamellated shells. They adhere to rocks, piles, and even to each other, by their most convex valve.

The animal—Peloris, Poli,—is one of the most simple of all the bivalves, possessing nothing remarkable but a double fringe round the mantle, the lobes of which are only united above the head, near the hinge; but there is no vestige of a foot.

O. edulis, L. The common oyster is well known to every one. Its fecundity is as astonishing as its flavour is delicious. Among the neighbouring species we may observe,

O. cristata, Poli, II, xx, or the little Mediterranean oyster. Among the foreign species we have,

O. parasitica, L.; Chemn., VIII, lxxiv, 681. Round and flat; it adheres to the roots of such mangroves and other trees of the torrid zone, as the salt-water can reach.

O. folium, L.; Ib., lxxi, 662, 666. Oval; the margin plicated in zig-zag; it attaches itself by the indentations in the back of its convex valve to the branches of the Gorgoniæ and other Lithophytes(2).

M. de Lamarck separates by the name of

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(1) The observations of M. Deshayes and Audouin even lead us to believe that, in a part of these shells, there were two muscular impressions.

(2) The various species of Oysters, on account of their irregularity, are not easily distinguished: to this genus are referred the *Ost. orbicularis*;—*O. fornicata*;—*O. sinensis*;—*O. Forskahlii*;—*O. rostrata*;—*O. virginica*;—*O. cornucopiæ*;—*O. senegalensis*;—*O. stellata*;—*O. ovalis*;—*O. papyracea*, and the *Mytilus crista-galli*;—*M. hyotis*;—*M. frons*, Gmel., and those figured by Brugière in the Encyc. Method., pl. 179, 188.

It is almost certain, however, that several of these pretended species are mere varieties.

The *Ost. semi-aurita*, Gualt., 84, H, is a young *Avicula hirundo*.

GRYPHÆA, Lam.,

Certain oysters, mostly fossil, of the ancient calcareous and schistous strata, in which the summit of the most convex valve greatly projects and curves more or less into a hook, or is partially spiral; the other valve is frequently concave. The greater number of these shells appear to have been free; some of them, however, seem to have adhered to other bodies by their hook(1).

G. tricarinata. The only living species known.

PECTEN, Brug.,

The Pectens, very properly separated from the Oysters by Brugière, although they have the same kind of hinge, are easily distinguished by their inequivalve semi-circular shell, almost always regularly marked with ribs, which radiate from the summit of each valve to the edge, and furnished with two angular productions called *ears*, which widen the sides of the hinge. The animal,—ARGUS, Poli, has but a small oval foot(2) placed on a cylindrical pedicle before a sac-like abdomen that hangs between the branchiæ. Some species, known by a deep emargination under their anterior *ear*, are furnished with a byssus. The others cannot adhere, and even swim with rapidity by suddenly closing their valves. The mantle is surrounded with two ranges of filaments, several of the external ones being terminated by a little greenish globule. The mouth has numerous branched tentacula in place of the four, usual, labial leaflets. The shell is frequently tinged with the most lively colours.

The great species of the French coast, *Ostrea maxima*, L., has convex valves, one whitish, the other reddish, with fourteen ribs each, that are broad and longitudinally striated. The animal is eaten.

We may also remark the *Sole* of the Indian Ocean, *Ostrea solea*, Chemn., VII, lxi, 595, with extremely thin and almost equal valves, one brown, the other white, and internal ribs, fine as hairs, approximated two by two(3).

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(1) See Brug., Encyc. Method., pl. 189.

(2) Improperly styled by Poli the *abdominal trachea.*

(3) Add the ninety-one species of *Ostrea*, Gmel.; we must remember, however, that some of them are far from established on a solid foundation. For the fossil species, consult Sowerby (Mineral Conchology), and Brongniart, App. Cuv., Oss. Foss. tome II, Env. de Paris.

LIMA, Brug.

The Limæ differ from the Pectens in the superior length of their shell in a direction perpendicular to the hinge, the ears of which are shorter, and the sides less unequal, thus forming an oblique oval. The ribs of most of them are relieved with scales. The valves cannot join during the life of the animal, whose mantle is furnished with numberless filaments of different lengths without tubercles, and more internally, with a large border which closes the opening of the shell, and even forms a veil in front. The foot is small and the byssus trifling. The Limæ swim with rapidity by means of their valves.

One species, the *Ostrea lima*, L.; Chemn., VII, lxviii, 651, of a fine white, inhabits the Mediterranean. It is eaten(1).

PEDUM, Brug.

The oblong and oblique shell with small ears, of the Limæ; but the valves are unequal, and the one only that is most convex has a deep emargination for the byssus. The animal is similar to that of a Lima, but its mantle is only furnished with a single range of small, slender tentacula. Its byssus is larger.

But a single species is known; it inhabits the Indian Ocean(2).

Certain fossils may be placed here which have the hinge, ligament, and central muscle of the Ostreæ, Pectines, and Limæ, but are distinguished by some of the details of the shell.

HINNITA, Defr.

The Hinnitæ appear to be Ostreæ or Limæ with small ears, and adhering, irregular and very thick shells, the convex valve in particular. A depression is observed on the hinge for the ligament(3).

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(1) Add: *Ostrea glacialis*, Chemn., VII, lxviii, 652, 653;—*Ostr. excavata*, Ib., 654;—*Ostr. fragilis*, Ib., 650;—*Ostr. hians*, Gualt., LXXXVIII, FF, G. For the fossil species see Lamarck, Ann. du Mus., VIII, p. 461; Brocchi, Conch. Foss., and Sowerb., Min. Conch.

(2) *Ostrea spondyloïdea*, Gm., Chemn., VIII, lxxxii, 669, 670.

(3). Some living species have very lately been referred to the genus HINNITA, Defr. M. Gray,—Ann. of Phil., August 1826,—describes one by the name of *Hinnita gigantea;* Sowerby,—Zool. Journ. IX, p. 67, adds a second by that of *H. corallina;* finally, M. Deshaies refers the *Ostrea sinuosa*, L., to this genus, and de-

PLAGIOSTOMA, Sowerb.

The oblique shell of a Lima, flattened on one side; very small ears; the valves more convex, striated, without scales, the opening for the byssus smaller(1). Found in formations anterior to chalk.

PACHYTES, Defr.

Nearly the same form as that of the Pectines; shell regular, with small ears; a flattened transverse space between their summits, which in one of the valves is marked by a deep triangular notch, in which passed the ligament. Found in chalk(2). In the

DIANCHORA, Sowerb.,

The values are oblique and irregular, one of them adherent and with a perforated summit, the other free and with ears(3).

PODOPSIS, Lam.

Regular striated valves without opercula; the summit of one of them more salient, truncated and adherent, frequently very thick, and forming a sort of pedestal to the shell(4).

Although multivalve, we should approximate the

ANOMIA, Brug.

To the Ostreæ. The Anomiæ have two thin, unequal, irregular valves, the flattest of which is deeply notched on the side of the ligament, which is similar to that of the Ostreæ. The greater part of the central muscle traverses this opening to be inserted into a

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scribes a fourth living species under the name of *Hinnita Defrancii*; M. Defrance also admits two fossil species, the *H. Cortesii*, Blainv., Malac., pl. lxi, f. 1, and the *H. Dubuissonii*.

(1) *Plagiostoma gigas*, Sowerb., Encyc. Method., Test., pl. 238, f. 3;—*Pl. lævigatum*, Parkins., Org. Rem., III, pl. xiii, f. 6; and the other species given by Sowerby, Min. Conch., pl. 113, 114, and 382.

(2) *Pachytos spinosus*, Fr. Sowerb., Cuv., Oss. Foss., II, Env. de Paris, pl. iv, 2, A, B, C, and Blainv., Malac., pl. lv, f. 2:—*Pach. hoperi*, Sowerb., 380.

(3) *Dianch. striata;—D. lata*, Sowerb., Min. Conch., pl. 80.

(4) *Podops. truncata*, Encyc. pl. 188, f. 2, 6, 7; Cuv., Oss. Foss.; Env. de Paris, pl. v, f. 2.

N.B. M. de Blainville considers these four last genera as more nearly related to the *Terebratulæ*. M. Deshayes, on the contrary, Ann. des Sc. Nat. Dec. 1828, approximates them to the Spondyli.

third plate that is sometimes stony and sometimes horny, by which the animal adheres to foreign bodies, and the remainder of it (the muscle) serves to join one valve to the other. The animal,—Echion, Poli, has a small vestige of a foot, similar to that of a Pecten, which slips between the emargination and the plate that closes it, and perhaps serves to direct water to the mouth which is close to it(1).

These shells are found attached to various bodies like the Ostreæ. They are found in every sea(2).

Placuna, Brug.

A small genus allied to the Anomiæ, in which the valves are thin, unequal, and frequently irregular, as in the latter, but both entire. Two projecting ribs, en chevron, are seen on the inside of one of them, near the hinge.

The animal is not known, but it must resemble that of the Ostreæ, or that of the Anomiæ(3).

Spondylus, Lin.

A rough and foliaceous shell as in the Ostreæ, and frequently spiny; but the hinge is more complex; besides the cavity for the ligament, analogous to that of the Ostreæ, there are two teeth to each valve that enter into fossæ in the opposite one; the two middle teeth belong to the most convex valve, which is usually the left one, and which has a projecting heel, flattened as if sawed through behind the hinge. The animal, like that of a Pecten, has the borders of its mantle furnished with two rows of tentacula, some of the external ones being terminated by coloured tubercles; before the abdomen is a vestige of a foot formed like a broad radiated disk on a short pedicle, and endowed with the faculty of contraction and expansion(4). From its centre hangs a filament, terminated by an oval mass, the use of which is unknown.

The Spondyli are eaten like oysters. Their shells are frequently tinged with the most brilliant colours. They adhere to all sorts of bodies(1).

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(1) This foot escaped the notice of M. Poli.

(2) *Anomia ephippium*, Gm.;—*A. cepa;*—*A. electrica;*—*A. squamula;*—*A. aculeata;*—*A. squama;*—*A. punctata;*—*A. undulata;*—and the species added by Brugières, Encyc. Method., Vers., I, 70, et seq.; and pl. 170, 71.

The other *Anomiæ* of Gmelin are *Placunæ*, *Terebratulæ*, and *Hyalæ*.

(3) *Anomia placenta*, Chemn., VIII, lxxix, 716;—*An. sella*, Ib., 714. See also pl. 173 and 174, Encyc. Method., Vers.

(4) Called by Poli "*the abdominal trachea*" in the *Spondyli*, &c.

PLICATULA, Lam.

The Plicatulæ, separated by Lamarck from the Spondyli, have nearly the same kind of hinge but no heel, and flat, almost equal, irregular, plicated and scaly valves, as in many of the Ostreæ(2).

MALLEUS, Lam.

A simple pit for the ligament as in the Ostreæ, where the Mallei were left by Linnæus, on account of their having the same irregular and inequivalve shell, but distinguished by a notch on the side of this ligament for the passage of a byssus.

The most known species, *Ostrea malleus*, L.; Chemn., VIII, lxx, 655, 656, which ranks among the number of high-priced and rare shells, has the two ends of the hinge extended and forming something like the head of a hammer, of which the valves, elongated in a transverse direction, represent the handle. It inhabits the Archipelago of India.

There are some others, possibly young ones of the same species, in which the hinge is not prolonged. We must be careful not to confound them with the Vulsellæ(3).

VULSELLA, Lam.

A little salient plate inside of the hinge of each side, from one of which to the other extends the ligament, otherwise similar to that of the Ostreæ. By the side of this plate is a notch for the byssus, as in the Mallei. The shell is elongated in a direction perpendicular to the hinge.

The most known species inhabit the Indian Ocean(4).

PERNA, Brug.

Several parallel cavities across the hinge, opposed to each other in the two valves, and lodging as many elastic ligaments; the irregular and foliaceous shell marked on the anterior side and under the hinge by a notch traversed by the byssus. The Pernæ were also left by Linnæus among the Ostreæ(1).

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(1) *Spondylus gædcropus*, Chemn., VII, xliv, et seq., IX, cxv;—*Sp. regius*, Id., xlvi, 471.

(2) *Spond. plicatus*, L., Chem. VII, xlvii, 479, 482;—*Plicat. ægyptia*, Savign., Egyp. Coq., pl. xiv, f. 5.

(3) *Ostrea vulsella*, Chemn., VIII, lxx, 657, of which the *Ostrea anatina*, Ib. 658, 659, is probably a mere accidental variety.

(4) *Mya vulsella*, Chemn., VI, ii, 10, 11;—*V. spongiarum*, Lam., Savig., Eg., Coq. pl. xiv, f. 2;—*V. hians*, Lam., Sav., Ib., f. 3.

CRENATULA, Lam.

The Crenatulæ, lately separated from the Pernæ, instead of having transverse cavities on a broad hinge, are furnished with oval ones on the very margin, where they occupy but little of its breadth. The byssus seems to be wanting, and they are frequently found among sponges(2).

It is thought that we may approximate to the Pernæ, certain fossil shells, in which the hinge is also furnished with cavities more or less numerous, that correspond to each other, and thus appear to have furnished points of attachment to ligaments: thus those of the

GERVILIA, Defr.

Have a shell closely resembling that of the Volucellæ, but with a kind of double hinge, externally with opposed cavities, receiving as many ligaments, and internally furnished with very oblique teeth in each valve. Their impressions are found along with Ammonites in compact limestone(3). The

INOCERAMUS, Sowerb.

Is remarkable for the elevation and inequality of the valves, the summit of which curves in a hook towards the hinge, and which has a lamellated texture(4).

CASTILLUS, Brong.

Independently of the depressions for the ligament, the Castilli are marked by a conical sulcus, sunk in a lip, which is bent at a right angle to form one of the margins of the shell. The valves are about equal, and of a fibrous texture. They appear to have had a byssus(1).

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(1) *Ostrea isognomum*, Chemn., VII, lix, 584;—*O. perna*, Ib., 580;—*O. legumen*, Ib., 578;—*O. ephippium*, Ib., lviii, 576;—*O. mytiloïdes*, Herm., Nat. Berl., Schr. II, ix, 9.

(2) *Ostrea picta*, Gm., Chemn., VII, lviii, 575, or *Crenatula phasionoptera*, Lam., Encyc. Method., Test., pl. 216, f. 2;—*Crenatula avicularis*, Lam., Ann. du Mus, III, pl. ii, f. 3, 4;—*Cr. mytiloïdes*, Id., Ib. f. 1 and 2. See also the great work on Egypt, Coq. pl. xii.

(3) *Gervilia solenoïdes*, Defr., Blainv., Malac., lxi, 4.—*G. pernoïdes*, Deslonchamps, Soc. Lin. du Calvados, I, 116.—*G. siliqua*, Id. Ib., &c.

(4) *Inoceramus concentricus*, Parkins., Cuv., Oss. Foss., II, pl. vi, f. 11;—*Inocer. sulcatus*, Id., Ib., f. 12.

PULVINITES, Defr.

A regularly triangular shell, in which the few depressions diverge from the summit on the inside. The impression is found in chalk(2).

In the second subdivision of the Ostracea, as well as in almost all the bivalves which follow, besides the single transverse muscular mass of the preceding genera, there is a fasciculus which is placed before the mouth, and extends from one valve to the other. It is apparently in this subdivision that we must place the

ETHERIA, Lam.

Large inequivalve shells, as irregular as those of the Ostreæ, and more so; no teeth to the hinge; the ligament partly external and partly internal. They differ from the Ostreæ in having two muscular impressions. The animal is not seen to produce a byssus(3).

They have lately been discovered in the Upper Nile(4).

AVICULA, Brug.

An equivalve shell with a rectilinear hinge, frequently extended into wings by its extremities, furnished with a narrow and elongated ligament, and sometimes with small notches near the mouth of the animal; in the anterior side, a little beneath the angle of the side of the mouth, is a notch for the byssus. The anterior transverse muscle is excessively small.

The species with less salient ears form the PINTADINÆ, Lam., or MARGARITÆ, Leach.

The most celebrated, *Mytilus margaritiferus*, L., Chemn. VIII, lxxx, 717, 721, has nearly a semicircular shell, greenish without, and ornamented with the most beautiful nacre within. The latter is employed in the arts, and it is from the extravasation of this substance that are produced the oriental or fine pearls, taken by the divers at Ceylon, in the Persian Gulf, &c.

The name of AVICULA is appropriated to such as have more pointed ears, and a more oblique shell. The vestige of a tooth, of which traces are visible in the Pintadinæ, is observed on the hinge, before the ligament.

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(1) *Catillus Cuvieri*, Brong., Cuv., Oss. Foss., II, pl. iv, f. 10.

(2) *Pulvinites Adansonii*, Defr., Blainv., Malac., lxii, bis, 3.

(3) *Etheria elliptica*, Lam., Ann. du Mus. X, pl. xxix, and xxxi;—*Eth. trigonula*, Ib., pl. xxx;—*Eth. seminularis*, Ib., pl. xxxii, f. 1, 2;—*Eth. transversa*, Ib., f. 3, 4.

(4) *Eth. Caillaudi*, Voy. de Caillaud à Méroé, II, pl. lxi, f. 2, 3.

One species, *Mytilus hirundo*, L., Chemn., VIII, lxxxi, 722—728, that inhabits the Mediterranean, is remarkable for the pointed ears which extend its hinge on each side. Its byssus is coarse and stout, resembling a little tree(1).

PINNA, Lin.

The Pinnæ have two equal valves, forming a segment of a circle, or resembling a half-opened fan, which are closely united by a ligament along one of their sides. The animal, the CHIMÆRA, Poli, is elongated, like its shell; the lips, branchiæ, and other parts are in the same proportion. The mantle is closed along the side of the ligament; the foot resembles a little conical tongue excavated by a sulcus; it is furnished with a small transverse muscle situated at the acute angle formed by the valves, near which is the mouth, and with a very large one in their broader portion. By the side of the anus, which is behind this large muscle, is a conical appendage, peculiar to the genus, susceptible of expansion and elongation, the use of which is unknown(2).

The byssus of several species of Pinna is as fine and brilliant as silk, and is employed in fabricating the most precious stuffs. Such is the

P. nobilis, L., Chemn. VIII, lxxxix; which is moreover recognized by the valves being roughened with recurved and semitabular plates. It remains half buried in the sand, and anchored by its byssus(3). In the

ARCA, Lin.(4)

The valves are equal and transverse, that is to say, the hinge occupies the longest side. It is furnished with a large number of small teeth, which interlock with each other, and, as in the subsequent genera, with two fasciculi of transverse and nearly equal muscles, inserted into the extremities of the valves, which serve to close them. In the

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(1) Several species are now made of it. See Lam., An. sans Verteb., VI, part I, p. 146, et seq.

(2) M. Poli calls it also an *abdominal trachea*, just as erroneously as he applies the same name to the foot of the *Pectines*, &c.

(3) The whole genus Pinna may remain as it is in Gmelin: it is well to remember, however, that some of his species may be found to form but one. See also Lam., An. sans Vert., VI, part I, p. 130, et seq., and Sowerb., Gen. of Shells, No. XXVI.

(4) M. de Blainville forms his family of the ARCACEA or POLYODONTES, from the genus ARCA.

Arca, Lam.,

Or the Arcæ properly so called, the hinge is rectilinear, and the shell most elongated in a direction parallel to it. The summits are generally convex, and curve over the hinge, but are separated from each other. The valves do not close perfectly in the centre, because there is a horny plate or tendinous fillet before the abdomen of the animal(1) that serves for a foot, and by which it adheres to submerged bodies. They are found in rocky bottoms near the shore, and are usually covered with a hairy epidermis. They are not much esteemed for the table.

Some species are found in the Mediterranean(2), and a great many fossil, in strata anterior to chalk, particularly in Italy.

Certain Arcæ in which the teeth of the two ends of the hinge assume a longitudinal direction, are distinguished by Lamarck under the name of Cucullæa(3).

We ought also, it is probable, to separate the species with well marked ribs, and completely closing and interlocking edges; for we must presume that their animal is not fixed, but rather resembles that of a Pectunculus(4).

We have a still better warrant for removing the *Arca tortuosa*, Chemn., VIII, liii, 524, 525, in its fantastic figure and unequally oblique valves(5).

Pectunculus, Lam.

The hinge forming a curved line, and the shell lenticular; the valves always close completely, and their summits are approximated. The animal, Aximea, Poli, is furnished with a large compressed foot with a double inferior margin which enables it to crawl. They live in ooze. Some species are found on the coast of France(6).

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(1) The Daphne, Poli.

(2) *Arca Noæ*, Chemn., VII, liii, 529, 531;—*Arca barbata*, Id., liv, 535, 537;—*A. ovata*, Ib., 538;—*A. magellanica*, Ib. 539;—*A. reticulata*, Ib. 540;—*A. candida*, Id., lv, 542, 544;—*A. indica*, Ib., 543;—*A. cancellata*, Schrœd., Intr., III, ix, 2.

(3) *Arca cucullata*, Chemn., VII, liii, 526, 528;—*Cucullæa crassatina*, Lam., Ann. du Mus., VI, 338.

(4) *Arca antiquata*, L. Chemn., VII, lv, 548, 549;—*A. senilis*, Id., lvi, 554, 556;—*A. granosa*, Ib. 557;—*A. corbiculata*, Ib., 558, 559;—*A. rhomboïdea*, Ib., 553;—*A. jamaicensis*, List., 229, 64.

(5) It forms the genus Trisis, Oken.

(6) *Arca pilosa*, L., Chemn., VII, lvii, 565, 566;—*Arc. glycimeris*, Ib., 564;—*A. decussata*, Ib., 561;—*A. æquilatera*, Ib., 562;—*A. undata*, Ib., 560;—*A. marmorata*, Ib., 563;—*A. pectunculus*, Id., lviii, 568, 569;—*A. pectinata*, Ib., 570, 571.

Nucula, Lam.

The Nuculæ are Arcæ, in which the teeth are arranged on a broken line. Their form is elongated, and narrowed near the posterior extremity. Their animal is unknown, but is probably not far removed from those of the preceding shells(1).

This has long been the place assigned to the

Trigonia, Brug.

So remarkable for the hinge, which is furnished with two plates en chevron, crenulated on both faces, each of which penetrates into two cavities, or rather between four plates of the opposite side, similarly crenulated on their internal surface.

The internal impressions on the shell had already warranted the supposition that the animal was not provided with long tubes. Messrs Quoy and Gaymard have lately discovered living specimens of this genus, and in fact, its mantle, as in the Arcæ, is open and without any separate orifice, even for the anus. The foot is large, its anterior portion trenchant and like a hook.

The living Trigoniæ resemble the Cardiæ in the form of their shell, and the ribs which furrow it: its interior is composed of nacre(2).

The fossil Trigoniæ are different. Their shell is flattened on one side, oblique, longest in a direction perpendicular to the hinge, and traversed in a contrary direction by series of tubercles(3).

FAMILY II.

MYTILACEA.

In the second family of the testaceous Acephala, the mantle is open before, but has a distinct aperture for the fæces.

All these bivalves have a foot, used in crawling, or at least serving to draw out, direct and place the byssus. They are commonly known under the generic name of Muscles.

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(1) *Arca pellucida*, Chemn., VII, liv, 541;—*Arca rostrata*, L., Id., lv, 550, 551;—*Arc. pella*, Ib., 546;—*Arc. nucleus*, Id., lviii, 574.

(2) The *Trigonie nacrée*, Lam., Ann. du Mus. IV, lxvii, 1.

(3) *Trig. scabra*, Encyc. Method., pl. 237, f. 1; *Tr. nodulosa*, Ib., 2;—*Tr. navis*, Ib., 3;—*Tr. aspera*, Ib. 4. See also Parkins., Org. Rem., III, pl. xii.

MYTILUS, Lin.

The true Mytili or Sea-Muscles have a closed shell, with equal, convex and triangular valves. One of the sides of the acute angle forms the hinge, and is furnished with a long, narrow ligament. The head of the animal is in the acute angle; the other side of the shell, which is the longest, is the anterior one, and allows the passage of the byssus; it terminates in a rounded angle, and the third side ascends towards the hinge, to which it is joined by an obtuse angle; near this latter is the anus, opposite to which the mantle forms an opening or small particular tube. The animal—CALLITRICHE, Poli, has the edges of its mantle provided with branched tentacula near the rounded angle, as it is there that the water enters required for respiration. Before, and near the acute angle is a small transverse muscle, and a large one behind, near the obtuse angle. Its foot resembles a tongue.

In the true Mytili the summit is close to the acute angle.

Some of them are striated and others smooth.

Myt. edulis, L. This common Muscle is frequently seen suspended in extended clusters, along the whole coast of France, to rocks, piles, &c. &c. It forms a considerable item of food, but is dangerous if eaten to excess(1).

Some of them are found fossil(2). In the

MODIOLUS, Lam.

Separated from the Mytili by Lamarck, the summit is lower and near the third of the hinge. This summit is also more salient and rounded, approximating the Modioli more closely to the ordinary form of the bivalves(3). We may also separate from the Mytili the

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(1) Add *Mytilus barbatus*, L., Chemn., VIII, lxxxiv, 749;—*M. angulatus*, Ib., 756;—*M. bidens*, Ib., 742, 745;—*M. afer*, Ib., lxxxiii, 739—741;—*M. smaragdinus*, Ib., 745;—*M. versicolor*, Ib., 748;—*M. lineatus*, 753;—*M. exustus*, Ib., 754;—*M. striatulus*, Ib., 744;—*M. bilocularis*, Ib., lxxxii, 736;—*M. vulgaris*, Ib., 732;—*M. sexatilis*, Rumph., Mus. xlvi, D;—*M. fulgidus*, Argenv., xxii, D; probably the same as the *Mya perna*, Gm., Chemn., VIII, lxxxiii, 738;—*M. azureus*, Ib. H;—*M. murinus*, Ib., K;—*M. puniceus*, Adans., I, xv, 2;—*M. niger*, Ib., 3;—*M. lævigatus*, Ib., 4, &c.: some of these, however, may be mere varieties.

(2) M. Brongniart has formed them into a subgenus by the name of MYTILOIDA, Ap. Cuv. Oss. Foss. tome II, pl. iii, f. 4.

(3) *Mytilus modiolus*, Chemn., VIII, lxxxv, 757—760, and that of Mull., Zool. Lan., II, lii, which appears to be another species;—*M. discors*, Chemn., VIII, lxxxiv, 764—768;—*M. testaceus*, Knorr., Vergn., IV, v, 4, &c.

LITHODOMUS, Cuv.,

In which the shell is oblong, and almost equally rounded at the two ends, the summit being close to the anterior extremity. The species of this subgenus at first simply attach themselves to stones like the common Mytili; subsequently, however, they perforate and excavate them in order to form cells, into which they enter, and which they never quit afterwards. Once entered, their byssus ceases to grow(1).

One of them, the *Mytilus lithophagus*, L., Chemn., VIII, lxxxii, 729, 730, is very common in the Mediterranean, where from its peppery taste it is esteemed as food.

A second, *Modiola caudigera*, Encyc. pl. 221, f. 8, has a very hard small appendage at the posterior extremity of each valve, which perhaps enables it to excavate its habitation.

ANODONTEA, Brug.

The anterior angle rounded like the posterior, and that next to the anus obtuse and almost rectilinear; the hinge of the thin and moderately convex shell has no appearance of a tooth whatever, being merely furnished with a ligament which extends along the whole of its length. The animal,—LIMNÆA, Poli, has no byssus; its foot, which is very large, compressed and quadrangular, enables it to crawl upon the sand or ooze. The posterior extremity of its mantle is provided with numerous small tentacula. The Anodontes inhabit fresh water.

Several species are found in France, one of which—*Mytilus cygneus*, L., Chemn., VIII, lxxxv, 762, is common in ponds, &c., with oozy bottoms. Its light and thin shells are used for milk-skimmers, but its flesh is not eaten on account of its insipidity(1).

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(1) M. Sowerby doubts this fact, which is, however, well attested by M. Poli from ocular demonstration—*Test. Neap.*, II, p. 215. The pl. xxxii of the same work, fig. 10, 11, 12, 13, also proves that the animal resembles that of a Mytilus, and not that of a *Pholas* or a *Petricola*.

The mode in which the *Lithodomi*, *Pholades*, *Petricolæ*, and some other bivalves perforate stones, has been the subject of much discussion; some of the disputants holding it to be effected by the mechanical action of the valves, and others simply by solution. See the Mém. of M. Fleuriau de Bellevue, Journ. de Phys., an X, p. 345; Poli, Test. Neap., II, 215, and Edw. Osler, Phil. Trans. part III, 1826, p. 342. All things considered, the first of these opinions, whatever be the difficulties it presents, seems to us to come nearest to the truth.

An oblong species, in which the hinge is granulated throughout its whole length, is distinguished by M. de Lamarck under the name of IRIDINA(2); the hind part of its mantle is somewhat closed(3).

Dr Leach distinguishes another by that of DIPSADA, where the angles are more decided, and in which there is a vestige of a tooth on the hinge.

UNIO, Brug.

These Mollusca resemble the Anodontes both in their animal and shell, with the exception of their hinge, which is more complex. There is a short cavity in the anterior part of the right valve, which receives a short plate or tooth from the left one, and behind it is a long plate which is inserted between two others on the opposite side. They also inhabit fresh water, preferring running streams.

Sometimes the anterior tooth is more or less stout and unequal, as in

Mya margaritifera, L.; Drap., X, 17, 19. A large thick species, the nacre of which is so beautiful that it is employed as pearls. Found in France; as is the

Unio littoralis, Lam., Drap., X, 20. A smaller and square species.

Sometimes the anterior tooth is laminiform, as in the

Mya pictorum, L.; Drap., XI, 1, 4. An oblong and thin species known to every one(4).

Lamarck distinguishes the

HYRIA, Lam.,

In which the angles are so decided that the shell is nearly triangular(5).

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(1) Add, *M. anatinus*, Chemn., VIII, lxxxvi, 763;—*M. fluviatilis*, List., clvii, 12;—*M. stagnalis*, Schrœd., Fluv., I, 1;—*M. zellensis*, Ib., II, 1;—*M. dubius*, Adans., XVII, 21; and the pl. 201, 202, 203, and 205, of the Encyc. Method., Test.

(2) *Irid. exotica*, Encyc. Method., Test., pl. 204;—Add *Irid. nilotica*, Caillaud, Voy. à Méroé, pl. lx, f. 11.

(3) See Deshayes, Mém. de la Soc. d'Hist. Nat. de Paris, 1827, III, p. 1, pl. 1.

(4) Numerous species, remarkable for size or form, inhabit the rivers and lakes of the United States. Messrs Say and Barnes, who have described them, have established some new subgenera among them.

(5) *Hyria rugosa*, Encyc. Method., pl. 247, 2.

Castalia, Lam.,

Where the slightly codiform shell is striated in radii; the teeth and plates of the hinge are transversely sulcated, which gives them them some affinity with the Trigoniæ(1).

There are certain Marine Mollusca which have a similar animal, and about the same kind of hinge, that should be placed near the Unios; the summits of the shell, however, are more convex, and it is marked by projecting ribs extending from the summits to the edge. They form the

Cardita, Brug.(2)

Which are more or less oblong or codiform, the inferior margin, in some, gaping(3).

Cypricardia, Lam.

Carditæ, in which the tooth under the summit is divided into two or three. Their form is oblong, and their sides unequal(4).

M. de Blainville also separates the

Coralliophaga, Blainv.,

Where the shell is thin, and the lateral plate considerably effaced, which may cause their approximation to Venus.

One of them is known which excavates coralline masses to form its habitation(5). The

Venericardia, Lam.

Only differ from the Carditæ, in the circumstance that the posterior plate of their hinge is shorter and more transverse, which caused their approximation to Venus; their form is almost round.

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(1) *Castalia ambigua*, Lam., Blainv., Malac., LXVII, 4.

(2) *Chama antiquata*, Chemn., VI, xlvii, 488—491;—*Ch. trapezia;*—*Ch. semiorbiculata;*—*Ch. cordata*, Id., 502, 503; and among the fossil species, one of the most singular, *Cardita avicularia*, Lam., Ann. du Mus., IX, pl. ix, f. 6, provided it should not be separated.

(3) *Chama caliculata*, Chemn., VII, i, 500, 501;—*Cardita crassicosta*, Brug., Encyc. pl. 234, f. 3.

(4) *Chama oblonga*, Gm., Chemn., VII, l, 504, 505, or *Cardita carinata*, Encyc., pl. 234, f. 2, or *Cypricarde de Guinée*, Blainv., Malac., LXV, bis, f. 6.

(5) *Chama coralliophaga*, Gm., Chemn., X, clxii, 1673, 1674, or *Cardita dactylus*, Brug., Encyc., pl. 234, f. 5;—*Coralliophaga carditoïdes*, Blainv., Malac., LXXVI, 3.

Judging from the impressions of its muscles on them, their animal must resemble that of the Carditæ and Unios(1).

Both of them approach the Cardia in their general form and the direction of their ribs. I suspect that this is also the place for the

CRASSATELLA, Lam.,—PAPHIA, Roiss.,

Which has sometimes been approximated to Mactra, and at others to Venus; the hinge has two slightly marked lateral teeth, and two very strong middle ones, behind which, extending to both sides, is a triangular cavity for an internal ligament. The valves become very thick by age, and the impression made by the margin of the mantle leads to the belief that there are no protractile tubes(2).

FAMILY III.

CHAMACEA.

The mantle closed and perforated by three holes, through one of which passes the foot; the second furnishes an entrance and exit to the water requisite for respiration, and the third for the excretion of fæces: these two latter are not prolonged into tubes as in the subsequent family. It only comprises the genus

CHAMA, Lin.,

Where the hinge is very analogous to that of a Unio, that is to say, the left valve near the summit is provided with a tooth, and further back with a salient plate, which are received into corresponding fossæ of the right valve. This genus has necessarily been divided into the

TRIDACNA, Brug.,

The shell greatly elongated transversely, and equivalve; the superior angle, which answers to the head and summit, very obtuse.

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(1) *Venus imbricata*, Chemn., VI, xxx, 314, 315, and the fossil species, Lam., Ann. du Mus., VII and IX, pl. xxxi and xxxii.

(2) *Venus ponderosa*, Chemn., VII, lxix, A—D, or *Crassatella tumida*, Lam., Ann. du Mus., VI, 408, 1; perhaps the *Mactra cygnus*, Chemn., VI, xxi, 207;—*Venus divaricata*, Chemn., VI, xxx, 317—319. This genus also comprises many fossil species, particularly abundant near Paris. See the work of M. Deshayes.

The animal is very singular, inasmuch as it is not, like most of the others, placed in the shell, but is directed, or, as it were, pressed out before. The anterior side of the mantle is widely opened for the passage of the byssus; a little below the anterior angle is another opening which transmits water to the branchiæ, and in the middle of the inferior side is a third and smaller one which corresponds to the anus, so that the posterior angle transmits nothing, and is only occupied by a cavity of the mantle open at the third orifice, of which we have just spoken.

There is but a single transverse muscle, corresponding to the middle of the margin of the valves. In

Tridacna, Lam.,

Or the Tridacnæ properly so called, the front of the shell as well as of the mantle has a wide opening with notched edges for the transmission of the byssus, which latter is evidently tendinous, and continues uninterruptedly with the muscular fibres.

Such is the celebrated and enormous shell of India, the *Chama gigas*, L.; Chemn., VII, xlix, which is decorated with broad ribs relieved by projecting semi-circular scales. Specimens have been taken that weighed upwards of three hundred pounds. The tendinous byssus which attaches them to the rocks, is so thick and stout that the axe is required to sever it. The flesh, though tough, is edible. In

Hippopus, Lam.

The shell is closed and flattened before as if truncated(1). In the

Chama, Brug.,

Or the true Chamæ, the shell is irregular, inequivalve, usually lamellar and rough, adhering to rocks, corals, &c., like that of an Oyster. Its summits are frequently very salient, unequal, and curled up. The internal cavity frequently has the same form without any external indication of the fact. The animal,—Psilopus, Poli,—has a small foot bent almost like that of man. Its tubes, if it have any, are short and disjointed, and the aperture in the mantle, which transmits the foot, is not much larger. Some species are found in the Mediterranean.

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(1) *Chama lazarus*, Chemn., VII, li, 507, 509;—*Ch. gryphoïdes*, Ib., 510, 513; —*Ch. archinella*, Id. lii, 522, 523;—*Ch. macrophylla*, Ib., 514, 515;—*Ch. foliacea*, Ib., 521;—*Ch. citrea*, Regenf., IV, 44;—*Ch. bicornis*, Ib., 516—520.

There are also several that are fossil(1).

DICERAS, Lam.

Between Diceras and the Chamæ there is no essential difference; the cardinal tooth of the former is very thick and the spiral lines of the valves are sufficiently prominent to remind us of two horns(2). In the

ISOCARDIA, Lam.,

We observe a free, regular, and convex shell, with spirally curled summits, divided anteriorly. The animal,—GLOSSUS, Poli,—only differs from that of an ordinary Chama in having a larger and more oval foot, and because the anterior opening of its mantle begins to resume its ordinary proportions.

A large, smooth, red species, the *Chama cor*, L.; Chemn., VII, xlviii, 483, inhabits the Mediterranean(3).

FAMILY IV.

CARDIACEA.

The mantle is open before, and there are, besides, two separate apertures, one for respiration, the other for the fæces, which are prolonged in tubes, sometimes distinct, and at others united in one single mass. There is always a transverse muscle at each extremity, and a foot generally used for crawling. It may be considered as a general rule, that those which are furnished with long tubes, live in ooze or in sand. This mode of organization may be recognized on the shell by the more or less depressed contour described by the insertion of the edges of the mantle previous to its uniting with the impression of the posterior transverse muscle(1).

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(1) See the Conchiol. Foss. Subap., of Brocchi, and the Coq. Foss. des Env. de Paris of M. de Lamarck.

(2) Fossil shells from the jurassic strata. *Dic. arietina*, Lam. de Saussure, Voy. aux Alpes, I, pl. ii, f. 1—4.

(3) Add *Ch. moltkiana*, Chemn., VII, xlviii, 484—487.

Cardium, Lin.

The Cardia, like many other bivalves, have an equivalve, convex shell, with salient summits curved towards the hinge, which, when viewing it sidewise, gives it the figure of a heart; hence its name of Cardium, heart, &c. Ribs, more or less elevated, are regularly distributed from the summits to the edges of the valves; but what chiefly distinguishes the Cardia, is the hinge, through which, in the middle, are two small teeth, and at some distance before and behind a projecting tooth or plate. The animal,—Cerastes, Poli,—has generally an ample aperture in the mantle, a very large foot forming an elbow in the middle and with its point directed forwards, and two short or but moderately long tubes.

Numerous species of Cardia are found on the coast of France, some of which are eaten, such as the

C. edule, L.; Chemn., VI, xix, 194. Fawn-coloured or whitish, with twenty-six transversely plicated ribs.

Under the name of Hemicardium, we might separate those species in which the valves are compressed from before backwards, and strongly carinated in the middle; for it seems almost certain, that a modification of the animal must be a necessary consequence of this singular configuration(2).

Donax, Lin.

The Donaces have nearly the same kind of hinge as the Cardia, but their shell is of a very different form, being a triangle, of which the obtuse angle is at the summit of the valves, and the base at their edge, and of which the shortest side is that of the ligament, or the posterior side, a rare circumstance in this degree, among bivalves. They are generally small, and prettily striated from the summits to the edges; their animal—Peronæa, Poli, is furnished with long tubes which are received into a sinus of the mantle. Some of them are found on the coast of France(1). The

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(1) They form the family of the Conchacea, Blainv.

(2) *Cardium cardissa*, VI, xiv, 143—146;—*Card. roseum*, Ib., 147;—*Card. monstrosum*, Ib. 149, 150;—*Card. hemicardium*, Id., xi, 159—161.

The other Cardia of Gmelin may remain where they are, the *C. gaditanum* excepted, which is a Pectunculus. There are several fossil species described by Messrs Lamarck, Brocchi, and Brongniart.

CYCLAS, Brug.

Separated from Venus by Brugière, like the Cardia and Donaces, has two teeth in the middle of the hinge, and before and behind, two salient, and sometimes crenulated plates; but the shell, as in several species of Venus, is more or less rounded, equilateral, and transversely striated. The animal has moderate tubes. The external tint is usually grey or greenish. The Cyclades inhabit fresh water.

One species, the *Tellina cornea*, L.; Chemn., VI, xiii, 133, is very common on the coast of France(2). M. Lamarck separates the

CYRENA, Lam.

Where the shell is thick, slightly triangular and oblique, covered with an epidermis, and otherwise distinguished from the Cyclades by having three cardinal teeth. The Cyrenæ also inhabit rivers, but there are none in France(3).

CYPRINA, Lam.

Also separated from the Cyclades by Lamarck; the shell is thick, oval, with recurved summits, and three stout teeth; further back is a plate, and under the teeth a large cavity, which receives a part of the ligament(1).

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(1) *Donax rugosa*, Chemn., VI, xxv, 250—252;—*D. trunculus*, Ib., xxvi, 253, 254;—*D. striata*, Knorr., Delic., VI, xxviii, 8;—*D. denticulata*, Chemn., I, c, 256, 257;—*D. faba*, Ib., 266;—*D. spinosa*, Ib., 258. Fossil species are numerous in the environs of Paris. See Lamarck, Ann. du Mus., VIII, 139, and Deshayes, Coq. foss. des Env. de Paris, I, pl. xvii, xviii.

The *Donax irregularis*, from the Environs of Dax, described by M. Bastorat in the Mém. de la Soc. d'Hist. Nat. de Paris, t. II, pl. iv, f. 19, A, B, is the type of a new genus lately established—Bullet. de la Soc. Lin. de Bourdeaux, II, by M. Charles Desmoulins, under the name of GRATELUPIA. It is distinguished from the Donaces by the presence of several dentiform lamellæ which accompany the cardinal teeth.

Several species of *Venus*, and some *Mactræ*, are mixed with these true Donaces by Gmelin.

(2) Add *Tellina rivalis*, Müll., Drap., X, 4, 5;—*Cyclas fontinalis*, Drap., Ib., 8—12;—*Cycl. caliculata*, Ib., 13, 14;—*Tellina lacustris*, Gm., Chemn., XIII, 135;—*Tell. amnica*, Ib., 134;—*Tell. fluviatilis; Tell. fluminalis*, Chemn., VI, xxx, 320.

(3) *Tell. fluminea*, Chemn., Ib., 322, 323;—*Venus coaxans*, Id., xxxii, 336; or *Cyrena ceylanica*, Lam., Encyc. Method., pen., pl. 302, f. 4;—*Venus borealis*, Id., VII, xxxix, 312, 314;—*Cyclas cardiniana*, Bosc., Shells., III, xviii, 4. Fossil species abound near Paris. See Deshayes, Coq. Foss., I, pl. 18, 19.

GALATHÆA, Brug.

The shell triangular; three teeth on the summit of one valve, and two on the other, en chevron; the lateral plates approximated(2).

But a single species is known; it inhabits the fresh waters of the East Indies.

It is here also that must be placed another genus separated from Venus, the

CORBIS, Cuv.—FIMBRIA, Megerl.

Marine testaceous Acephala, transversely oblong, which have also stout middle teeth, and well marked lateral plates; their external surface is furnished with transverse ribs so regularly crossed by rays, that it may be compared to wicker-work.

The impression of their mantle exhibiting no flexure, their tubes must be short(3).

Some of them are fossil(4). In the

TELLINA, Lin.

There are in the middle, one tooth on the left and two teeth on the right, frequently forked, and at some distance before and behind, on the right valve, a plate, which does not penetrate into a cavity of the opposite one. There is a slight plica near the posterior extremity of the two valves, which renders them unequal in that part, where they are somewhat open.

The animal of the Tellinæ—PERONÆA, Poli,—like that of the Donaces, has two long tubes for respiration and for the anus, which withdraw into the shell, and are concealed in a duplicature of the mantle.

Their shells are generally transversely striated, and decorated with beautiful colours.

Some of them are oval and thick.

Others are oblong and strongly compressed.

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(1) *Venus islandica*, Chemn., VI, xxxii, 342, Encyc. pl. 301, f. 1; a large fossil species is found in the hills of Siennois and near Dax, of Bourdeaux.

(2) The *Egeria*, Roiss., or *Galathæa*, Brug., Encyc., 249, and Lam., Ann. du Mus., V, xxviii, and *Venus hermaphrodita*, Chemn., VI, xxxi, 327—329? or *Venus subviridis*, Gm.

(3) *Venus fimbriata*, Chemn., VII, 43, 448.

(4) See Deshayes, Coq. Foss. des Envir. de Paris, I, xiv; Brongn., Mém. sur le Vicentin.

Some again are lenticular, where, instead of a plica, there is frequently nothing but a slight deviation of the transverse striæ(1).

We might separate certain oblong species which have no lateral teeth(2), and others, which, with the hinge of the Tellinæ, have not the plica of the posterior extremity—they are the TELLINIDES, Lam.(3)

It is necessary to distinguish from the Tellinæ, the

LORIPES, Poli,

In which the middle teeth of the lenticular shell are almost effaced, and where there is a simple sulcus for the ligament behind the nates. The animal is furnished with a short double tube, and its foot is prolonged into a kind of cylindrical cord. Besides the usual impressions, we may observe, on the inside of the shell, a line running obliquely from the print of the anterior muscle, which is very long, towards the nates. There is no flexure in the print of the mantle for the retractor muscle of the tube(4).

LUCINA, Brug.

Separated lateral teeth, as in the Cardia, Cyclades, &c., that penetrate between the plates of the other valve; in the middle are two teeth, frequently, but slightly apparent. The shell is orbicular, and without any impression of the retractor muscle of the tube; that of the anterior constrictor, however, is very long. Possessing similar traits of character with the Loripedes, their animals must be analogous(5).

The living species are much less numerous than those that are fossil; the latter are very common in the environs of Paris(6).

We should approximate to the Lucinæ, the UNGULINÆ, which also have an orbicular shell and two cardinal teeth; the lateral ones, however, are wanting, and the anterior muscular impression is not so long(1). The genus

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(1) These are the three divisions of Gmelin, but we must abstract from his genus Tellina: 1st. *Tell. Knorrii*, which is a polished Capsa; 2d. *Tell. inæquivalvis*, which is the genus *Pandora;* 3d. *Tell. cornea; T. lacustris; T. amnica; T. fluminalis; T. fluminea; T. fluviatilis*, which are Cyclades or Cyrenæ.

(2) *Tell. hyalina*, Chemn., VI, xi, 99;—*Tell. vitrea*, Ib., 101.

(3) *Tellinides timorensis*, Lam.

(4) *Tellina lactea.*

(5) *Venus pennsylvanica*, Chemn., VII, xxxvii, 394—396, xxxix, 408, 409;—*V. edentula*, Id., xl, 427, 429.

(6) *Lucina saxorum*, Lam., Deshayes, Coq. Foss. des Env. de Paris, I, pl. xv, f. 5, 6;—*Luc. grata*, Defr.; *Ibid.* pl. xvi, f. 5, 6;—*Luc. concentrica*, Lam., Desh., Ib., xvi, f. 11, 12.

VENUS, Lin.

Comprises many Testacea whose general character consists in the teeth and plates of the hinge being approximated under the summit, in a single group. They are usually more flattened and elongated, in a direction parallel to the hinge, than the Cardia. The ribs, when there are any, are almost always parallel to the edges, being directly the reverse of their arrangement in the Cardia.

The ligament frequently leaves an elliptical impression behind the summits, which has received the appellation of *vulva*, and before these same summits there is almost always an oval impression termed the *anus* or *lunula*(2).

The animal is always furnished with two more or less protractile tubes, sometimes united, and with a compressed foot, which enable it to crawl.

M. Lamarck appropriates the name of VENUS to those which have three small diverging teeth under the summit. This character is particularly well marked in the oblong and slightly convex species(3).

Some of them—the ASTARTÆ, Sowerb., or CRASSINÆ, Lam.,—have only two diverging teeth on the hinge, and approach the Crassatellæ in their thickness and some other characters(4).

Among the cordiform species, that is, those which are shorter and have more convex nates, and with more closely approximated teeth, we should remark those where the plates or transverse striæ terminate in crests(5) or tuberosities(6), and those that have longitudinal ribs and crests elevated behind.

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(1) *Ungulina transversa*, Kam., Sowerb., Gen. of Shells, No. X.

(2) These fantastic appellations of *vulva* and *anus*, have probably caused the extremity of the shell, which corresponds to the true anus of the animal, to be styled the anterior, and that where the mouth is situated, the posterior. We have restored to these extremities their true denominations. We must recollect that the ligament is always on the posterior side of the summits.

(3) *Venus litterata*, Chemn., VII, xli;—*V. rotunda*, Ib., xlii, 441;—*V. textilis*, Ib., 442;—*V. decussata*, xliii, 456, &c.

(4) *Venus scotica*, Hans Lerin, VIII, tab. 2, f. 3;—*Crassina danmoniensis*, Lam.; and among the fossil species, *Ast. lucida*, Sower., Min. Conch., II, pl. 137, f. 1;—*Ast. Osmalii*, Lajonkere, Soc. d'Hist. Nat. de Paris, I, tab. 6, f. 1.

(5) *Venus dysera*, Chemn., VI, 27, 299;—*Ven. plicata*, Encyc. pl. 275, 3, *a*, *b*; —*Ven. crebisulica*, Ib., f. 4, 5, 6.

(6) *Venus puerpera*, Encyc., 278;—*Ven. corbis*, Lam., Encyc. pl. 276, f. 4.

We subsequently and gradually come to the CYTHEREÆ, Lam., which have a fourth tooth on the right valve, projecting under the lanula, and received into a corresponding cavity in the right one.

Some of them have an elliptical and elongated form(1); others are convex(2), and it is among these latter that we must place a celebrated species (*Venus Dione*, L., Chemn., VI, 27, 271), from whose form originated the application of the name *Venus* to the genus. Its transverse plates terminate behind in salient and pointed spines.

There are some species of an orbicular form, and with slightly hooked summits, in which the impression of the retractor of the tubes forms a large and almost rectilinear triangle(3).

When their animals are better known, we shall most probably have to separate from the Cythereæ,

1. Those species of a compressed lenticular form, in which the nates are united into a single point. The fold of the contour of the mantle is wanting, and shows that their tubes are not protractile(4);
2. Those of a convexly orbicular form, in which the fold is not only wanting, but where, as in the Lucinæ, the impression of the anterior muscle is very long(5);
3. The thick species with radiated ribs, in which the fold is also wanting, and which connect the genus Venus with that of the Venericardia(6). In the

CAPSA, Brug.

Already separated from the former, there are two teeth on the hinge on one side, and a single, but bifid one on the other; the lunula is wanting, the shell convex and the fold, indicative of the retractor of the foot, considerable(7).

PETRICOLA, Lam.

Also separated from the same genus; the Petricolæ, on each side, have two or three very distinct teeth on the hinge, one of which is forked. The shell is more or less cordiform, but as they inhabit the interior of stones, it sometimes becomes very irregular. Judging from the marginal impressions of their mantle, their tubes must be very large(1).

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(1) *Venus gigantea*, Encyc., 28, 3;—*Ven. chione*, Chemn., VI, 32, 343;—*Ven. erycina*, Ib., 347;—*Ven. maculata*, Ib., 33, 345.

(2) *Ven. meretrix*;—*Ven. lusoria*;—*Ven. castrensis*.

(3) *Venus exoleta*, Chemn., VII, 38, 404—the genus ORBICULUS, Megerle.

(4) *Ven. scripta*, Chemn., VII, 40, 422.

(5) *Ven. tigrina*, Chemn., VII, 37, 390;—*Ven. punctata*, Ib. 397.

(6) *Ven. pectinata*, Chemn., VII, 39, 419—the genus ARTHEMIS, Oken.

(7) *Ven. deflorata*, Chemn., IV, ix, 79—82.

CORBULA, Brug.

Similar in form to the triangular Cythereæ, or cordate; but a single stout tooth in the middle of each valve, corresponding to the side of its antagonist. The ligament is internal; the tubes must be short, and the valves but rarely equal(2).

The fossil species are much more numerous than the living ones(3).

Some of them live in the interior of stones(4).

MACTRA, Lin.

The Mactræ are distinguished from the other Testacea of this family by their ligament being internal, and lodged throughout in a triangular depression, as in the oysters; they all have a compressed foot fitted for crawling. In the

MACTRA, Lam.,

Or the Mactræ properly so called, the ligament is accompanied to the left valve, before and behind, by a projecting plate which is received between two others on the right one. Close to the ligament, near the lunule, is a little plate en chevron. The tubes are united and short(5).

Some of them are found on the coast of France.

In the LAVIGNONS, the lateral plates are almost effaced, but a single small tooth is observable near the internal ligament; there is also a second and internal ligament. The posterior side of the shell is the shortest; the valves are somewhat open, and the tubes are separate and very long, as in the Tellinæ.

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(1) *Ven. lapicida*, Chemn., X, 172, 1664, and the RUPELLARIA of M. Fleriau de Bellevue;—*Ven. perforans*, Montag., Test. Brit. pl. iii, f. 6;—*Donax irus?* Chemn., VI; xxvi, 270.

(2) See Encyc. Method., Vers, pl. 230, f. 1, 4, 5, 6.

(3) *Corbula gallica;—C. complanata;—C. umbonella*, Desh., Coq. Foss., des Env. de Paris, t. I, pl. 7, 8, 9.

(4) *Venus monstrosa*, Chemn., VII, 42, 445—446.

(5) After abstracting the *Lavignones* and *Lutrariæ*, the genus MACTRA of Gmelin may remain as it is; the species, however, are far from being well distinguished. Add, *Mya australis*, Chemn., VI, iii, 19, 20.

The ERYCINÆ, Lam., are neighbours of the *Mactræ*, and are but badly characterized. See Ann. du Mus., IX, xxxi, and Deshayes, Coq. Foss., I, vi; part of them, perhaps, belong to the Crassatellæ. The AMPHIDESMÆ, Lam., or LIGULÆ, Montag., appear to approach the Mactræ, but they are too imperfectly known to have any distinctive character assigned to them.

There is one found on our coast, *Mya hispanica*, Chemn. VI, iii, 21, which lives in the ooze at the depth of several inches(1).

FAMILY V.

INCLUSA(2).

The mantle open at the anterior extremity, or near the middle only, for the passage of the foot, and extended from the other end into a double tube, which projects from the shell, whose extremities are always gaping. Nearly all of them live buried in sand, stones, ooze or wood. Those of the genus

MYA, Lin.

Have but two valves to their oblong shell, the hinge of which varies. The double tube forms a fleshy cylinder, and the foot is compressed. The different forms of the hinge have furnished Messrs Daudin, Lamarck, &c., with the following subdivisions(3), in the first three of which the ligament is internal.

LUTRARIA, Lam.,

The Lutrariæ, like the Mactræ, have a ligament inserted into a large triangular cavity of each valve, and before that cavity a small tooth en chevron; but the lateral plates are wanting; the gap of the valves is very wide, particularly at the posterior extremity, through which passes the thick, double, fleshy, respiratory and anal tube, a disposition which attaches them to this family. The foot, which issues at the opposite end, is small and compressed.

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(1) Improperly called by Gmelin *Mactra piperata*.

Add *Mactra papyracea*, Chemn., VI, xxiii, 231;—*Mact. complanata*, Id., xxiv, 238;—*Mya nicobarica*, Id., iii, 17, 18.

(2) M. de Blainville makes two families of this one, his PYLORIDEA and ADESMACEA. The last includes *Pholas*, *Teredo*, and *Fistulana;* the first, all the others, and even *Aspergillum*. There are numerous genera established in this family too slightly characterized to permit us to adopt them.

(3) N.B. Half the Myæ of Gmelin neither belong to this genus, nor even to this family, but to Vulsella, Unio, Mactra, &c.

Some of them are found in the sand at the mouths of rivers in France(1). In the

Mya, Lam.,

Or the Mya properly so called, one valve is furnished with a plate which projects into the other, and this latter with a cavity. The ligament stretches from this cavity to that plate.

Some species are found in the sand along the coast of France(2).

Anatina, Lam.

The Anatinæ of Lamarck should be approximated to the preceding Myæ. Each of their valves has a small projecting plate inside with the ligament extending from one to the other.

One oblong and excessively thin species is known, the valves of which are supported by an internal ridge(3); and another of a squarer form without the ridge(4). In the

Solemya, Lam.

The ligament is seen on the outside of the shell, part of it remaining attached to a horizontal internal cuilleron on each valve. There is no other cardinal tooth, and a thick epidermis projects beyond the edges of the shell.

One species, the *Tellina togata*, Poli, II, xv, 20, is found in the Mediterranean(5).

Glycymeris, Lam.—Cyrtodaria, Daud.

Neither teeth, plates, nor cavities on the hinge, but a simple callous enlargement, behind which is an external ligament. The animal resembles that of the Myæ.

The most common species—*Mya siliqua*, L.: Chemn. XI, 193, f. 194. is from the Arctic Ocean.

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(1) *Mactra lutraria*, List., 415, 259: Chemn., VI, xxiv, 240, 241;—*Mya oblonga*, Id., Ib., ii, 12:—*Acosta*, Brit. Conch., XVII, 4; Gualt., 90, A, fig. min.

(2) *Mya truncata*, L., Chemn., VI, i, 1, 2:—*M. arenaria*, Ib., 3, 4.

(3) *Solen anatinus*, Chemn., VI, vi, 46—48.

(4) Encyc., 230, 6, under the name of *Corbule*;—*An. hispidula*, Cuv., An. sans vert., Egyp. Coq. pl. vii, f 8. I suspect that the Rupicole of F. de Bellevue (Voy. Roissy, VI, 440) must approach this subgenus. They live in the interior of stones, like the *Petricolæ*, *Pholades*, &c.

(5) New-Holland furnishes a second species, the *Sol. australis*, Lam.

PANOPEA, Mesnard, Lagr.

A stout tooth, anterior to the callous enlargement of the preceding subgenus, and immediately under the summit, which decussates a similar one on the opposite valve, a character which approximates the Panopeæ to the Solens. A large species is found in the hills at the foot of the Appenines in so high a state of preservation, that it has been mistaken for a recent sea-shell(1).

There is another fossil species, which may perhaps be separated from it, that is completely closed at its anterior extremity(2).

After these various modifications of the Myæ, we may place the

PANDORA, Brug.

In which one valve is much flatter than the other; the internal ligament is placed transversely, accompanied in front by a projecting tooth of the flattened valve. The posterior side of the shell is elongated. The animal withdraws more completely into its shell than the preceding ones, and its valves shut more closely—its habits however are the same.

But a single species is well known; it inhabits the seas of Europe(3).

Here also we find a group of some small and singular genera, such as

BYSSOMIA, Cuv.

Where the oblong shell, which has no marked tooth, has the opening for the foot at about the middle of its edge and opposite the summits. The Byssomiæ also penetrate into stone, corals, &c.

A species which is provided with a byssus, abounds in the Arctic Ocean(4).

HIATELLA, Daud.

The shell gaping, to allow the passage of the foot, near the middle of its edges; but the tooth of the hinge is better marked than in the preceding genus. Ranges of salient spines are frequently observed on the hind part of the shell. They are found in sand, among Zoophytes, &c.

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(1) *Mya glycimeris*, L., Chemn., VI, iii. A neighbouring, but shorter species inhabits the Mediterranean. Another, fossil species is found near Bourdeaux.

(2) *Panope de Faujas*, Mesnard, Lagr., Ann. du Mus., IX, xii.

Here should be the place of the SAXICAVA of M. F. de Bellevue, small Testacea which perforate stones. See Roiss., VI, 441.

(3) *Tellina inæquivalvis*, Chemn., VI, xi, 106, and for the animal, Poli, II, xv, 7.

(4) *Mytilus pholadis*, Müll., Zool., Dan., lxxxvii, 1, 2, 3, or *Mya byssifera*, Fabr., Grœnl.

The North sea produces a small species(1).

Solen, Lin.

The shell only bivalve, oblong or elongated, but the hinge always furnished with salient and well marked teeth, and the ligament external. In the

Solen, Cuv.,

Or the Solens properly so called, the shell is cylindrically elongated, and has two or three teeth in each valve near the anterior extremity, where the foot issues. The latter is conical, and enables the animal to bury itself in the sand, which it excavates with considerable rapidity on the approach of danger.

Several species are found along the coast of France(2).

We might distinguish those species in which the teeth approximate to the middle; some of them still have a long and narrow shell(3).

In others it is wider and shorter; their foot is extremely thick. Two of the latter inhabit the Mediterranean(4). In

Sanguinolaria, Lam.,

The hinge is nearly the same as in the wide Solens, and has two teeth in the middle of each valve; but the two latter, which are oval, are much closer at the two extremities, where they merely gape, like certain Mactræ(5).

Psammobia, Lam.

The Psammobiæ differ from the Sanguinolariæ, in having but a single tooth in the middle of one valve, which penetrates between two on the opposite one(1).

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(1) *Solen minutus*, L., Chemn., VI, vi, 51, 52, or *Mya arctica*, Fabr., Grœnl., which appears to be the same as the *Hiat. à une fente*, Bosc, Coq. III, xxi, 1;—the *Hiat. à deux fentes*, Id., Ib., 2.

(2) *Solen vagina*, Chemn., VI, iv, 26—28;—*S. siliqua*, Ib., 29;—*S. ensis*, Ib., 30;—*S. maximus*, Ib., v, 35;—*S. cultellus*, Ib., 37.

(3) *Solen legumen*, Chemn., VI, v, 32, 34.

(4) *Solen strigilatus*, Chemn., VI, vi, 41, 43;—*S. radiatus*, Id., v, 38—40;—*S. minimus*, Ib., 31;—*S. coarctatus*, vi, 45;—*S. vespertinus*, Id., vii, 60. These two divisions have become the genus Solecurte of M. de Blainville.

(5) *Solen sanguinolentus*, Chemn., VI, vii, 56;—*S. roseus*, Ib., 55.

PSAMMOTHEA, Lam.

But a single tooth to each valve; otherwise resembling the Psammobiæ(2).

PHOLAS, Lin.

The Pholades have two broad valves, convex towards the mouth, narrow and elongated on the opposite side, and leaving a large oblique opening at each extremity; their hinge, like that of a true Mya, is furnished with a plate projecting from one valve into the other, and with an internal ligament running from that plate into a corresponding cavity. Their mantle is reflected externally upon the hinge, where it sometimes contains two or three supernumerary calcareous bodies. The foot issues through the aperture on the side next to the mouth, where it is widest, and from the opposite one project the two tubes, which are united and susceptible of inflation in every direction.

The Pholades inhabit canals which they excavate, some in ooze and others in stone, like the Lithodomi, Petricolæ, &c. They are much sought for on account of their agreeable flavour.

Several species are found on the coast of France: such is the *Dail commun; Pholas dactylus*, L.; Chemn., VIII, ci, 859(3).

TEREDO, Lin.

The mantle extended in a tube much longer than the two small, rhomboidal valves, and terminated by two short tubes, the base of which is furnished on each side with a stony and movable kind of operculum or palette. These Acephala, while quite young, penetrate and establish their habitations in submerged pieces of wood, such as piles, ships' bottoms, &c., perforating and destroying them in every direction. It is thought, that in order to penetrate as fast as it increases in size, the Pholas excavates the wood by means of its valves; but the tubes remain near the opening by which its entrance was effected, and through which, by the aid of its palette, it receives water and aliment. The gallery it inhabits is lined with a calcareous crust which exudes from its body, and which forms a second kind of tubular shell for it. It is a noxious and destructive animal in the sea ports of Europe.

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(1) *Tellina gari*, L., Poli, 15, 23;—*Solen vespertinus*, Chemn., VI, 7, 59;—*Psammobia maculosa*, Lam.? Egyp., Coq. pl. 8, f. 1; *Psamm. elongata*, Lam., Egyp., pl. 8, f. 2.

(2) *Psammothea violacea*, Lam., &c.

N.B. These two genera are united in one by M. de Blainville, called PSAMMOCOLA. On the whole, they differ but very slightly from the Sanguinolariæ. Great care is requisite in studying the shell, as the teeth are generally broken.

(3) Add *Pholas orientalis*, Ib., 860, which is, perhaps, a mere variety of *dactylus*;—*Phol. costata*, Ib., 863;—*Phol. crispata*, Id., cii, 872, 874;—*Phol. pusilla*, Ib., 867, 871;—*Phol. striata*, Ib., 864, 866.

Teredo navalis, L. This species, which is the most common, and is said to have been introduced into Europe from the torrid zone, has more than once threatened Holland with ruin by the destruction of its dikes. It is upwards of six inches in length and has simple palettes.

Larger species inhabit hot countries, whose palettes are articulated and ciliate. They should be remarked for their analogy to the Cirrhopoda. Such is the *Teredo palmulatus*, Lam., Adans., Ac. des Sc., 1759, pl. 9, f. 12.

FISTULANA, Brug.

Separated from Teredo; the external tube is entirely closed at its larger end, and is more or less like a bottle or club. The Fistulanæ are sometimes found buried in submerged fragments of wood or in fruits, and the animal, like that of a Teredo, has two small valves, and as many palettes. Recent specimens are only obtained from the Indian Ocean, but they are found fossil in Europe(1). We should approximate to them the

GASTROCHÆNA, Spengler.

Where the shells are deprived of teeth, and their edges being wide apart anteriorly, leave a large oblique opening, opposite to which there is a small hole in the mantle for a passage of the foot. The double tube, which can be retracted completely within the shell, is susceptible of being greatly elongated. It appears that they are certainly furnished with a calcareous tube(1).

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(1) *Teredo clava*, Gmel., Spengl., Naturforsch., XIII, 1 and 2, copied Encyc. Method., Vers., pl. clxvii, f. 6—16. It is the *Fistulana gregata*, Lam.;—*Teredo utriculus*, Gm., Naturf., X, i, 10; probably the same as the *Fistulana lagenula*, Lam., Encyc., Method., I, c, f. 23;—*Fistulana clava*, Lam., Ib., 17, 22.

It is probable that the *Pholas teredula*, Pall., Nov. Act. Petrop., II, vi, 25, is also a Fistulana.

In some of them, as in the Mytili, the summits are at the anterior angle(2); in others they are placed near the middle(3).

They inhabit the interior of Madrepores, which they perforate.

Two genera of Acephala furnished with tubes, have been detected among fossils, but the first of them, the

TEREDINA, Lam.,

Has a little cuilleron on the inside of each of its valves, and a small, free, shield-shaped piece on the hinge(4). In the second,

CLAVAGELLA, Lam.,

One of the valves is clasped by the tube, leaving the other, however, free(5).

A single living species is found in the Madrepores of the Sicilian seas, which has been described by M. Audouin.

Some naturalists think we should also place in this family the

ASPERGILLUM, Lam.,

The shell of which is formed of an elongated conical tube, closed at its widest extremity by a disk perforated with numerous small tubular holes; the little tubes of the outer range being longest, form a kind of corolla round it. The reason for approximating them to the Acephala with tubes is found in the fact that there is a double projection on one part of the cone which really resembles the two valves of the Acephala. The affinity between these little tubes and those which envelope the tentacula of certain Terebella, formerly caused this animal to be referred to the Annelides.

The species most known,—*Asper. javanum*, Mart., Conch., I, pl. 1, f. 7, is seven or eight inches in length(6).

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(1) This tube has been observed by Messrs Turton, Deshayes, and Audouin.

(2) *Pholas hians*, Chemn., X, clxxii, 1678, 1679.

(3) Id., 1681, a very different species from the preceding, not properly distinguished by Chemnitz.

(4) *Teredina personata*, Lam., and Desh., Foss. de Par. I, pl. i, f. 23, 28.

(5) *Cl. echinata*, Lam., Ann. du Mus., XII, xlii, 19, *Cl. coronata*, Desh., Foss., I, v, 15, 16.

(6) Add the *Arrosoir à manchettes*, Savig., Egyp., Coq. pl. xiv, f. 9.

ORDER II.

ACEPHALA NUDA(1).

The naked Acephala(2) are not numerous, and are sufficiently removed from the ordinary Acephala, to form a distinct class, were such a division considered requisite. Their branchiæ assume various forms, but are never divided into four leaflets; the shell is replaced by a cartilaginous substance which is sometimes so thin that it is as flexible as a membrane. We divide them into two families.

FAMILY I.

SEGREGATA(3).

This family comprises those genera in which the individuals that compose them are insulated and without any mutual organic connection, although frequently living in society. In the

BIPHORA, Brug.—THALIA, Brown,—SALPA and DAGYSA, Gmelin,

The mantle and its cartilaginous envelope are oval or cylindrical, and open at the two extremities. Near the anus, the opening is transverse, wide, and furnished with a valve which permits the entrance of water, but not its exit; near the mouth, it is simply tubular. Muscular bands embrace the mantle and contract the body. The animal moves by taking in water at the posterior aperture, and forcing it out through that near the mouth, so that it is always propelled backwards, a circumstance which has led some naturalists into error by causing them to mistake the posterior opening for the true mouth(1). It usually swims on its back. The branchiæ form a single tube or riband, furnished with regular vessels, placed obliquely in the middle of the tubular cavity of the mantle, in such a manner that it is constantly bathed by the water as it traverses that cavity(2). The heart, viscera, and liver are wound up near the mouth and towards the back; but the position of the ovary varies. The mantle and its envelope when exposed to the sun exhibit the colours of the rainbow, and are so diaphanous, that the whole structure of the animal can be seen through them: in many they are furnished with perforated tubercles. The animal has been seen to come out from its envelope without appearing to suffer pain. The most curious circumstance respecting them, is their remaining united for a long time, just as they were in the ovary, and thus swimming in long chains where the individuals are disposed in different ways, but each species always according to the same order.

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(1) Since called by De Blainville ACEPHALOPHORA HETEROBRANCHIATA. As to Lamarck, he makes a separate class of them, which he calls the TUNICATA, and which he places between his *Radiata* and his *Vermes*; but these animals having a brain, nerves, a heart, vessels, liver, &c. this arrangement is inadmissible.

(2) Or the *Acephales sans coquilles* of our author. *Am. Ed.*

(3) As this family has received no name from our author, I have been compelled, in conformity with the plan adopted from the commencement of the work, to remedy the omission, for such I consider it, by the above word; in the selection of which I have been governed by that which the Baron himself affixes to the second family, or his *Aggregés*. *Am. Ed.*

M. de Chamisso assures us that he has verified a still more singular fact relative to these animals; it is, that the individuals which have thus issued from a multiplex ovary, are not furnished with a similar one, but produce insulated young ones of various forms, which have an ovary like that which produced their parent, so that there is, alternately, a generation of a few insulated individuals, and another of numerous and aggregate ones, and that these two alternating generations do not resemble each other(3).

It is very certain that in some species little individuals have been observed adhering to the interior of large ones, by a peculiar kind of sucker, which were different in form from those that contained them(4).

These animals are very abundant in the Mediterranean and the warmer portions of the ocean, and are frequently phosphorescent.

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(1) This has also happened to M. de Chamisso, in his *Dissert. de Salpis*, Berl., 1819, and to others after him, but it is evident that there is no good reason for changing the denomination of parts in an animal merely because it swims on its back, with the head behind. It is thus that naturalists have been led into error with respect to the organization of the *Pterotrachcata*, which always swim on their back, a mode of natation common to numberless Gasteropoda both testaceous and naked.

(2) Some authors assert that this tube is perforated at both ends, and that the water traverses it; I have endeavoured to convince myself of the truth of this assertion, but in vain.

(3) Chamisso, loc. cit., I, p. 4.

(4) See my Mem. sur les Biphores, f. II.

The Thaliæ, Brown, have a small crest or vertical fin near the posterior extremity of the back(1).

Of the Salpæ, properly so called, some have a gelatinous dark coloured plate, in the substance of the mantle and above the visceral mass, which may be the vestige of a shell(2).

In others it is a simple prominence, of the same nature as the rest of the mantle, but thicker(3).

Others again have neither plate nor prominence, but their mantle is extended by points, and of these

Some have a point at each extremity(4).

Others have two at the extremity nearest the mouth(5), and even three or more(6).

Some have but a single one at this same extremity(7).

The greater number is simply oval or cylindrical(8). In the

Ascidia, Lin.—*Theyton* of the Ancients,

The mantle and its cartilaginous envelope, which is frequently very thick, resemble sacs everywhere closed, except at two orifices, which correspond to the two tubes of several bivalves, one serving to admit water and the other affording a passage to the fæces. The branchiæ form a large sac, at the bottom of which are the mouth and the visceral mass. The envelope is much larger than the mouth, which is fibrous and vascular, and on which, between the two tubes, is one of the ganglions. These animals attach themselves to rocks and other bodies, and are deprived of all power of locomotion; the chief sign of vitality which they exhibit, consists in the absorption and evacuation of water through one of their orifices; when alarmed they eject it to a considerable distance. They abound in every sea, and some of them are eaten(1).

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(1) *Holothuria Thalia*, Gm., Brown's Jam., xliii, 3;—*H. caudata*, Ib., 4;—*H. denudata*, Encyc. Method., Vers., lxxxviii;—*Salpa cristata*, Cuv., Ann. du Mus., IV, lxviii, 1, figured under the name of *Dagysa* by Home, Lect. on Compar. Anat. II, lxiii;—*Salpa pinnata*, Forsk., xxv, B.

(2) *Salpa scutigera*, Cuv. Ann. du Mus., IV, lxviii, 4, 5, probably the same as the *Salpa gibba*, Bosc., Vers, II, xx, v.

(3) *Salpa Tilesii*, Cuv., loc. cit. 3;—*S. punctata*, Forsk., xxv, C.;—*S. pelagica*, Bosc., loc. cit., 4;—*S. infundibuliformis*, Quoy and Gaym., Voy. de Freycin., Zool. 74, f. 13.

(4) *Salpa maxima*, Forsk., xxxv, A;—*S. fusiformis*, Cuv., loc. cit., 10, perhaps the same as Forsk., xxxvi;—*S. mucronata*, Ib., D;—*S. aspera*, Chamisso, f. iv;—*S. runcinata*, Id., f. v, G, H, 1. But, according to the author, it is the aggregate generation of a species, of which the other generation is cylindrical.

(5) *Salpa democratica*, Forsk., xxxvi;—*S. longicauda*, Quoy and Gaym., loc. cit., pl. 73, f. 8;—*S. constata*, Ib., f. 2.

(6) *Salpa tricuspis*, Ib., f. 6;—*S. spinosa*, Otto., Nov. Ac. Nat. Cur., t. pl. xlii, f. 1.

(7) *Holothuria zonaria*, Gm., Pall., Spic., X, i, 17;—*Thalia lingulata*, Blumenb., Abb., 30.

(8) *Salpa octofora*, Cuv., loc. cit., 7; perhaps the same as the small *Dagysæ*, Home, loc. cit., lxxiii, 1;—*S. africana*, Forsk., xxxvi, C;—*S. fasciata*, Ib., D;—*S. confederata*, Ib., A; perhaps the same as the *S. gibba*, Bosc., loc. cit., 1, 2, 3;—*S. polycratica*, Ib., F;—*S. cylindrica*, Cuv., loc. cit., 8 and 9;—*Dagysa strumosa*, Home, I, c., lxxi, 1;—*S. ferruginea*, Chamiss., X;—*S. cærulescens*, Id., ix;—*S. vaginata*, Id., vii, and several others.

Some species are remarkable for the long pedicle which supports them(2).

FAMILY II.

AGGREGATA.

The second family consists of animals more or less analogous to the Ascidiæ, but united in a common mass, so that they seem to communicate organically with each other, and in this respect to connect the Mollusca with the Zoophytes; but independently of their peculiar organization, these animals, according to the observations of Messrs Audouin and Milne Edwards, at first live and swim separately, only becoming united at a certain subsequent period, a fact which is in direct opposition to this opinion.

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(1) The whole genus Ascidia, Gm., to which must be added the *Asc. gelatinosa*, Zool. Dan., xliii;—*Asc. pyriformis*, Ib., clvi;—*Salpa sipho*, Forsk., xliii, C;—*Ascidia microsma*, Redi, Opusc., III, Pl., App., VII, the same as the *Asc. sulcata*, Coquebert, Bullet. des Sc. Avril, 1797, I, 1;—*Asc. glandiformis*, Coqueb., Ib.—N.B. The *Ascidia canina*, Mull., Zool. Dan., lv, *Asc. intestinalis*, Bohatsch, X, 4, and perhaps even the *Asc. patula*, Mull., lxv, and *A. corrugata*, Id., lxxix, 2, appear to form but one species. There are also some interversions of synonymes, and the species, generally, are far from being well ascertained.

M. de Savigny has endeavoured to subdivide the Ascldiæ, Mem. sur les Anim. sans vert., part II, 1816, into several subgenera, such as,

1st. The Cynthiæ, whose body is sessile and branchial sac longitudinally plicated; their envelope is coriaceous;

2d. The Phallusiæ, which differ from the Cynthiæ in the branchial sac which is not plicated; their envelope is gelatinous;

3d. The Clavellinæ, whose branchial sac is without plicæ, and does not penetrate to the bottom of the envelope, and whose body is supported by a pedicle; their envelope is gelatinous;

4th. The Boltenlæ, whose body is pediculate, and the envelope coriaceous.

He also takes into consideration the number and form of the tentacula which internally surround the branchial orifice, but these characters, which are partly anatomical, cannot be applied with certainty to a great number of species.

M. Macleay (Lin. Trans., XIV, part III) establishes two more, Cystingia and Dendrodoa, founded on similar characters.

(2) *Ascidia pedunculata*, Edw., 356; and *Asc. clavata*, or *Vorticella Boltenii*, Gm.

Their branchiæ, as in the Ascidiæ, form a large sac, traversed by the aliment before it arrives at the mouth; their principal ganglion is also situated between the mouth and the arms; a nearly similar disposition obtains with respect to the viscera and ovary(1).

Notwithstanding this, some of them, like the Biphora, have an opening at each extremity. Such is the

BOTRYLLUS, Gært.,

Of an oval form, fixed on various bodies, and united by tens or twelves, like the rays of a star. The branchial orifices are at the external extremities of these rays, and the anus terminates in a common cavity, which is in the centre of the star. If an orifice be irritated, but a single animal contracts; if the centre be touched they all contract. These very small animals attach themselves to certain Ascidiæ, Fuci, &c.(2)

In some particular species, three or four stars appeared to be piled one on the other(3).

PYROSOMA, Peron.

The Pyrosomæ unite in great numbers, forming a large hollow cylinder, open at one end and closed at the other, which swims in the ocean by the alternate contraction and dilatation of the individual animals which compose it. The latter terminate in a point on the exterior, so that the whole external surface of the tube is bristled with them; the branchial orifices are pierced near these points, and the anus debouches in the internal cavity of the cylinder. A Pyrosoma may thus be compared to a great number of stars of Botrylli strung together, the whole of which is movable(4).

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(1) It is to M. de Savigny that we are indebted for our recent knowledge of the singular organization of the whole of this family, formerly confounded with the Zoophytes properly so called. At the same time, Messrs Desmarets and Lesueur made known the particular structure of the *Botrylli* and *Pyrosomæ*. See the excellent work of M. Savigny in his Mem. sur les anim. sans verteb., part II, fasc. I.

(2) See Desmarets and Lesueur, Bullet. des Sc. May 1815;—*Botryllus stellatus*, Gærtner, or *Alcyonium Schlosseri*, Gm., Pall., Spic. Zool., X, iv, 1—5.

(3) *Botryllus conglomeratus*, Gært., or *Alcyonium conglomeratum*, Gm.; Pall., Spic. Zool. X, iv, 6.

(4) See Desmarets and Lesueur, loc. cit.

The Mediterranean and the Ocean produce large species, the animals of which are arranged with but little regularity. They exhibit a phosphorescent appearance during the night(1).

A smaller species is also known(2) where the animals are arranged in very regular rings.

The remainder of these aggregated Mollusca, like the ordinary Ascidiæ, have the anus and branchial orifice approximated to the same extremity. The species known are all fixed, and till now they have been confounded with the Alcyonia. The visceral bundle of each individual is more or less extended into the common cartilaginous or gelatinous mass, more or less narrowed or dilated in certain points; but each orifice always forms a little six-rayed star on the surface. We unite them all under the name of

POLYCLINUM(3).

Some of them are extended over bodies like fleshy crests(4).

Others project in a conical or globular mass(5),

Or expand into a disk comparable to that of a flower or of an Actinia(6), or are elongated into cylindrical branches supported by slender pedicles, &c.(7), or form parallel cylinders(8).

Recent observations even seem to show that the ESCHARÆ, hitherto placed among the POLYPI, belong to this family of the Mollusca(9).

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(1) Several of the *Polyclina* and *Aplidia* of Savigny.

(2) *Pyrosoma atlanticum*, Péron., Ann. du Mus., IV, lxxii;—*Pyrosoma gigas*, Desmar., and Lesueur, Bullet. des Sc. June 1815, pl. v, f. 2.

(3) The *Pyrosome élégant*, Lesueur, Bullet. des Sc., June 1815, pl. v, f. 2.

(4) It is from the number of strangulations, that is to say, the greater or less separation of the branchiæ, stomach and ovary, that M. de Savigny has formed his POLYCLINUM, APLIDIUM, DIDEMNUM, EUCŒLIUM, DIAZONA, SIGILLINA, &c. which, in our opinion, need not be retained. Here, also, should come the *Alcyonium ficus*, Gm.; the *Distomus variolosus*, Gærtn., or *Alcyonium ascidioïdes*, Gm., Pall., Spic. Zool., X, iv, 7.

(5) The *Eucœlium*, Savig.; the *Distomi* are arranged in the same manner.

(6) The genus *Diazona*, Sav., consisting of a large and beautiful purple species discovered near Ivice by M. Delaroche.

(7) The genus *Sigillina*, Sav., whose cylindrical branches are frequently a foot long, and the animals, slender as threads, but three or four inches.

(8) The genus *Synocium*, Lam.

(9) Messrs Audouin and Milne Edwards on the one hand, and M. de Blainville on the other, have lately verified this fact, which the observations of Spallanzani previously seemed to announce.

CLASS V.

BRACHIOPODA(1).

The Mollusca Brachiopoda, like the Acephala, have a bilobed mantle which is always open. Instead of feet they are provided with two fleshy arms, furnished with numerous filaments, which they can protrude from, and draw into the shell. The mouth is between the base of the arms. Neither their organs of generation, nor their nervous system are well known.

All the Brachiopoda are invested with bivalve shells, fixed and immovable. But three genera are known.

Lingula, Brug.

Two equal, flat, oblong valves, the summits of which are at the extremity of one of the narrow sides, gaping at the other end, and attached between the two summits to a fleshy pedicle, which suspends them to the rocks; the arms become spirally convoluted previously to entering the shell. It appears that the branchiæ consist of small leaflets, disposed around the internal face of each lobe of the mantle.

But a single species—*Lingula anatina*, Cuv., Ann. du Mus., I, vi, Seb., III, xvi, 4, is known. It inhabits the Indian Ocean, and has thin, horny and greenish valves(2).

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(1) M. de Blainville has given to my Brachiopoda the name of Palliobranchiata, and makes an order of them in his class of the Acephalophora.

(2) Linnæus, who knew but one of the valves, called it *Patella unguis*. Solander and Chemnitz, who were aware of its having two, called it, the one, *Mytilus lingua*, and the other, *Pinna unguis*. Brugières knew its pedicle, and consequently made a genus of it by the name of Lingula, Encyc. Method., Vers, pl. 250. It is singular that before us, no one had remarked that it is well figured with its pedicle by Seba, loc. cit.

TEREBRATULA, Brug.

Two unequal valves united by a hinge; the summit of one, more salient than the other, is perforated to permit the passage of a fleshy pedicle which attaches the shell to rocks, madrepores, other shells, &c. Internally, a small bony piece of frame-work is observed, that is sometimes very complex, composed of two branches which articulate with the unperforated valve and that support two arms edged all round with a long, close fringe, between which, on the side next to the large valve, is a third, simply membranous and much longer appendage, usually spirally convoluted, and edged, like the arms, with a fine and close fringe. The mouth is a small vertical fissure between these three large appendages. The principal part of the body, situated near the hinge, contains the numerous muscles which reach from one valve to the other, and between them are the viscera, which occupy but little space. The ovaries appear to be two ramified productions, adhering to the parietes of each valve. I have not yet been able to ascertain exactly the position of the branchiæ.

Numberless Terebratulæ are found fossil or petrified, in certain secondary strata of ancient formations(1). The living species are less numerous(2).

The shell of some is transversely broader or longer, in a direction perpendicular to the hinge, with an entire or emarginated contour, with two or several lobes; some of them are even triangular; the surface is smooth, sulcated in radii, or veined; they are thick or thin, and even diaphanous. In several of them, in lieu of the hole in the summit of the thin valve, there is a notch, and this notch is sometimes partly formed by two accessory pieces, &c. It is probable that when better known their animals will present generic differences. Already in the

SPIRIFER, Sowerby,

Two large cones have been recognized, formed of a spiral thread, which appear to have supported the animal(3). In

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(1) M. Defrance distinguishes upwards of two hundred.

(2) *Anomia scobinata*, Gualt., 96, A;—*An. aurita*, Id., Ib., B;—*An. retusa*;—*An. truncata*, Chemn., VIII, lxxvii, 711;—*An. capensis*, Ib., 703;—*An. pubescens*, Id., lxxviii, 702;—*An. detruncata*, Ib., 705;—*An. sanguinolenta*, Ib., 706;—*An. vitrea*, Ib., 707, 709;—*An. dorsata*, Ib., 710, 711; *An. psittacea*, Ib. 713; *An. cranium*, &c. For the fossil species see Encyc. Method. Vers, pl. 239—246.

(3) For this genus see Sowerb., Min. Conch. and the article *Spirifère* of M. Defrance, Dict. des Sc. Nat. t. L.

THECIDEA, Def.

The pedicle seems to have been incorporated with the small valve(1).

ORBICULA, Cuv.

The Orbiculæ have two unequal valves, one of which, that is round and conical, when viewed by itself, resembles the shell of a Patella; the other is flat and fixed to a rock. The arms of the animal, —*Criopus*, Poli,—are ciliated and spirally recurved like that of the Lingulæ.

The seas of Europe produce a small species, *Patella anomala*, Müll., Zool. Dan. V, 26; *Anomia turbinata*, Poli, XXX, 15; Brett. Sowerb., Lin. Trans., XIII, pl. xxvi, f. 1.

The DISCINÆ, Lam., are Orbiculæ, the inferior valve of which is marked by a fissure. The

CRANIA, Brug.

Should be approximated to the Orbiculæ. The arms of the animal are also ciliated, but the shells have deep and round internal muscular impressions, that have caused it to be compared to the figure of a skull.

One of them inhabits European seas; *Anomia craniolaris*, L.; or *Crania personata*, Bret., Sowerb., Lin. Trans., XIII, pl. xxv, f. 3. Several are fossil; such as the *Cran. antiqua*, and the others of which M. Hœninghaus has given an excellent Monograph.

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(1) *Thecidea mediterranea*, Risso, Hist. Nat. de la Fr. Merid., IV, f. 185;—*Th. radiata*, Fauj. Mont. de St Pierre, pl. xxvii, f. 8. Further and more precise observations are requisite to enable us to class the MAGAS of Sowerby, the STRIGOCEPHALA of Defrance, and some other neighbouring groups.

CLASS VI.

CIRRHOPODA(1).

[Lepas and Triton, Lin.]

The Cirrhopoda, in several points of view, are intermediate between this division and that of the Articulata. Enveloped by a mantle, and testaceous pieces which frequently resemble those seen in several of the Acephala, their mouths are furnished with lateral jaws, and the abdomen with filaments named cirri, arranged in pairs, composed of a multitude of little ciliated articulations, and corresponding to a sort of feet or fins similar to those observed under the tail of several of the Crustacea. Their heart is situated in the dorsal region, and the branchiæ on the sides; the nervous system forms a series of ganglions on the abdomen. These cirri, however, may be considered as analogous to the articulated appendages of certain species of Teredo, while the ganglions in some respects are mere repetitions of the posterior ganglion of the bivalves. The position of these animals in the shell is such, that the mouth is at the bottom and the cirri near the orifice. Between the last two cirri is a long fleshy tube, that has sometimes, but erroneously, been taken for their proboscis, and at the base of which, near the back, is the opening of the anus. Internally, we observe a stomach inflated by a multitude of small cavities in its parietes, which appear to fulfil the functions of a liver, a simple intestine, a double ovary, and a double serpentine oviduct, whose walls produce the prolific fluid, and which, prolonged in the fleshy tube, open at its extremity. These animals are always fixed. Linnæus comprised them all in one genus—LEPAS, which Brugières divided into two, that have in their turn been subdivided(1).

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(1) M. Delamarck has changed this name into Cirripeda, making it a class. M. de Blainville also makes a class of them, but he changes the name to Nematopoda, and places them with the Chitones, in what he calls his type of the Malentozaria.

ANATIFA, Brug.

A compressed mantle, open on one side and suspended to a fleshy tube, varying greatly as to the number of testaceous pieces with which it is furnished; twelve pair of cirri, six on each side, those nearest to the mouth being the thickest and shortest. The branchiæ are elongated pyramidal appendages that adhere to the external base of the whole of the cirri, or of part of them.

The two principal valves, of the most numerous species (PENTALASMIS, Leach,) resemble those of a Mytilus; two others seem to complete a part of the edge of the Mytilus opposite to the summit, and an azygous fifth one unites the posterior edge to that of the opposite valve; these five pieces cover the whole of the mantle. From the usual place of the ligament arises the fleshy pedicle; a strong transverse muscle unites the two first valves near their summit; the mouth of the animal is concealed behind it, and the posterior extremity of its body, with all the little articulated feet, is a little beyond it, between the four first valves.

The most common species of the European seas, *Lepas anatifera*, L., owes its specific appellation to the fable which represents it as producing the *Bernacles* and *Macreuses*, a story founded on the rude resemblance that has been observed to exist between the pieces of this shell and a bird. The Anatifæ adhere to rocks, piles, keels of vessels, &c.(2) We may distinguish from them:

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(1) This name of *Lepas* formerly belonged to the *Patellæ*. Linnæus, supposing that some of these Cirrhopoda existed which had no shells, gave them the name of *Triton:* but the existence of these Tritons is not confirmed, and we are to conclude that Linnæus merely saw the animal of an Anatifa torn from its shell.

(2) Add *Lepas anserifera*, Chemn., VIII, c, 856;—*Anat. dentata*, Brug., Encyc. Method., pl. 166, f. 6, or *Pentalasmis falcata*, Leach, Edinb. Encyc.

Pollicipes, Leach,

Where, besides the five principal valves, there are several small ones near the pedicle(1), some of which, in certain species, are nearly as large as the former(2); frequently there is an azygous valve, opposite to the ordinary one of the same description. In the

Cineras, Leach,

The cartilaginous mantle contains but five small valves, which do not occupy the whole of its extent(3). In the

Otion, Leach.

The cartilaginous mantle contains but two very small valves, with three little grains which hardly merit that name, and has two tubular auriform appendages(4).

Tetralasmis, Cuv.

But four valves, which surround the aperture; two of them longer than the others. The animal is partly confined within the pedicle, which is large, and covered with hair. They are a kind of tubeless Balani(5).

Balanus, Brug.

The principal part of the shell of the Balani consists of a testaceous tube attached to various bodies, the aperture of which is more or less closed by two or four valves. This tube is formed of various pieces, which appear to be detached, and separated in proportion as the growth of the animal requires it. The branchiæ, mouth, articulated tentacula, and the anal tube, differ but little from those of the Anatifæ. In

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(1) *Lepas pollicipes*, L., or *Poll. cornucopia*, Leach; Encyc. Method., pl. 266, f. 10, 11;—*Poll. villosus*, Leach, Edinb. Encyc.

(2) *Lepas mitella*, Chemn., VIII, 849, 850, Encyc. Method., pl. 266, f. 9, or *Polylepe couronné*, Blainv., Malac.;—*Poll. scalpellum*, Chemn., VIII, p. 294, or *Polylepe vulgaire*, Blainv., Malac., lxxxiv, f. 4. It is the genus Scalpellum, Leach, loc. cit.

(3) *Cineras vittata*, Leach, Edinb. Encyc., or *Lepas coriacea*, Poli, vi, 20, or *Gymnolepas Cranchii*, Blainv., Malac., lxxxiv, 2.

(4) *Otion Cuvieri*, Leach, or *Lepas leporina*, Poli, I, vi, 21, or *Lepas aurita*, Chemn., VIII, pl. c, f. 857, 853. M. de Blainville unites *Cineras* and *Otion* in his genus Gymnolepa.

(5) *Tetral. hirsutus*, Cuv., Moll. Anatif., f. 14.

N.B. The Lithotrias of Sowerby, converted by Blainville into Litholepa, may be, as is conjectured by Rang, merely an Anatifa accidentally fixed in a hole excavated by some bivalve.

The Alepas, Rang, should be Anatifæ, whose cartilaginous mantle is without any shell whatever; I have never seen them. At all events, they must not be confounded with the *Triton* of Linnæus, which was the animal of an Anatifa separated from its mantle and shell.

Balanus

Properly so called, the tubular portion is a truncated cone formed of six projecting pieces, separated by as many depressed ones, three of which are narrower than the others. Their base is usually formed of a calcareous lamina, and fixed to various bodies. The four valves of their operculum close the orifice exactly.

The rocks, shells, &c., on the coast of Europe, are, in a manner, covered with a species of Balanus, the *Lepas balanus*, L., Chemn., VIII, xcvii, 826, 1(1). Naturalists have separated from it

The Acastæ, Leach, whose base is irregular, convex towards the exterior, and which does not become fixed; most of them are found in sponge(2);

The Coniæ, Blainv., the tube of which has but four salient pieces(3).

The Asemæ, Ranzani, where the tube has no decidedly salient pieces(4);

The Pyrgomæ, Savigny, whose tubular position, forming a strongly depressed cone, has but a very small orifice, almost like the shell of a Fissurella(5);

The Octhosiæ, Ranzani, which have but three salient pieces in the tube and only two valves to the operculum(6);

The Creusiæ, Leach, with four salient pieces, and two valves to the operculum(7).

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(1) Add, *Lepas balanoïdes*, Chemn., VIII, xcvii, 821—825;—*L. tintinnabulum*, Ib., 828—831;—*L. minor*, Ib., 827;—*L. porosa*, Id., xcviii, 836;—*L. verruca*, Ib., 840, 841;—*L. angusta*, Ib., 835;—*L. elongata*, Ib., 838;—*L. patellaris*, Ib., 839;—*L. spinosa*, Ib., 840;—*L. violacea*, Id., xcix, 842;—*L. tulipa*, Ascan. Icon., X;—*L. cylindrica*, Gronov., Zooph., XIX, 3, 4;—*L. cariosa*, Pall., Nov. Act. Petrop., II, vi, 24, A, B.

(2) *Acasta Montagui*, Leach, Edinb. Encyc., copied Blainv., Malac., lxxxv, 3; —*Lepas spongites*, Poli, I, vi, 5.

(3) *Conia radiata*, Blainv., Malac., lxxxv, 5.

(4) *Lepas porosus*, Gm., Chemn., VIII, xcviii, 836, 837, Encyc. Method., pl. 165, f. 9, 10.

(5) *Pyrgoma cancellata*, Leach, loc. cit., copied Blainv., Malac., lxxxv, 5.

(6) *Lepas Strœmii*, Müll., Zool. Dan., III, xciv, 1—4.

(7) *Creusia spinulosa*, Leach, loc. cit., copied Blainv., Malac., lxxxv, 6.

M. Delamarck, under the name of CORONULÆ, separates the very wide species, where the parietes of the cone are occupied by cells so large that they resemble chambers(1); and under that of

TUBICINELLÆ, those in which the tubular portion is elevated, narrower near the base, and divided into annuli, which mark its growth(2).

There are some species of these last two subgenera, which affix themselves to the skin of the Balænæ, and even penetrate into their blubber.

To the preceding subgenera must be added the

DIADEMA, Ranz.

Where the tubular portion is almost spherical, and which has but two small valves almost hidden in the membrane which closes the operculum. The opercular valves would not effectually close the orifice without the membrane which unites them.

They also live on the Balænæ, and Otiones are frequently observed attached to their surface(3).

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(1) *Lepas balænaris*, L., Chemn., VIII, xcix, 845, 846;—*L. testudinarius*, Ib., 847, 848, which attaches itself to the shell of Tortoises.

(2) The *Tubicinella*, Lam., Ann. du Mus., I, xxx, 1, 2.

(3) *Lepas diadema*, Chemn., VIII, xcix, 843, 844.

THIRD GREAT DIVISION OF THE ANIMAL KINGDOM.

ANIMALIA ARTICULATA.

This third general form is as well characterised as that of the Vertebrata; the skeleton is not internal as in the latter, neither is it annihilated as in the Mollusca. The articulated rings which encircle the body, and frequently the limbs, supply the place of it, and as they are usually hard, they furnish to the powers of motion all requisite points of support, so that here, as among the Vertebrata, we find the walk, the run, the leap, natation and flight. Those families only are restricted to reptation which are either deprived of feet, or in which the articulations are membranous and soft. This external position of the hard parts, and the internal one of the muscles, reduce each articulation to the form of a sheath, and allow it but two kinds of motion. When connected with the neighbouring parts by a firm joint, as happens in the limbs, it is fixed there by two points, and can only move by gynglymus, that is, in one single plane, a disposition which requires a greater number of joints to produce a same variety of motion. A greater loss of muscular power is also the result, and consequently more general weakness in each animal, in proportion to its size.

But the parts which compose the body are not always articulated in this way; most generally they are only united by flexible membranes, or they fit into each other, and then their motions are more various, but have not the same force.

The system of organs in which the Articulata resemble each other the most, is that of the nerves.

Their brain, which is placed on the esophagus, and furnishes nerves to the parts adhering to the head, is very small. Two cords which embrace the esophagus are extended along the abdomen, and united at certain distances by double knots or ganglia, whence arise the nerves of the body and limbs. Each of these ganglia seems to fulfil the functions of a brain to the surrounding parts, and to preserve their sensibility for a certain length of time, when the animal has been divided. If to this we add, that the jaws of these animals, when they have any, are always lateral and move from without, inwardly, and not from above, downwards, and that no distinct organ of smell has hitherto been discovered in them, we shall have expressed all that can be said of them in general. The existence however of the organs of hearing, the existence, number and form of those of sight, the product and mode of generation(1), the kind of respiration, the existence of the organs of circulation, and even the colour of the blood present great differences, which must be noticed in the various subdivisions.

Distribution of the Articulata into four Classes.

The Articulata, whose mutual relations are as varied as numerous, present however four principal forms, either internal or external.

The ANNELIDES, Lam., or RED-BLOODED WORMS, Cuv., constitute the first. Their blood, which is generally red, like that of the Vertebrata, circulates in a double and closed system of arteries and veins, sometimes furnished with one or several visible hearts or fleshy ventricles. Respiration is performed in organs which are sometimes developed externally, and at others remain on the surface of the skin or dip into its interior. Their body, more or less elongated, is always divided into numerous rings, the first of which, called the head, scarcely differs from the rest, except in the presence of the mouth and the principal organs of the senses. The branchiæ of several are uniformly distributed along their body or on its middle; in others, which are generally those that inhabit tubes, they are all placed anteriorly. They never have articulated feet, but most of them, in lieu thereof, are furnished with setæ or fasciculi of stiff and movable hairs. They are mostly hermaphrodites, and some of them require a reciprocal coitus. The organs of their mouth sometimes consist in jaws, more or less strong, and at others of a simple tube, those of the external senses in fleshy, and sometimes articulated tentacula, and in certain blackish points, considered as eyes, but which do not exist in all the species.

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(1) M. Hérold has made a remarkable discovery on this subject, viz. that in the ovum of the Crustacea and Arachnides, the vitellus communicates with the exterior by the back. See his Dissert. on the ovum of Spiders, Marburg, [illegible], and that of M. Rathke on that of the Astaci, Leipzig, 1829.

The CRUSTACEA constitute the second form or class of articulated animals. They are provided with articulated and more or less complex limbs, attached to the sides of the body. Their blood is white: it circulates by means of a fleshy ventricle placed in the back, which receives it from the branchiæ, situated on the sides of the body, or under its posterior portion, and to which it returns by a ventral and sometimes double canal. In the last or lower species, the heart or dorsal ventricle is itself extended into a tube. They all have antennæ or articulated filaments inserted in the fore-part of the head, usually four in number, several transverse jaws and two compound eyes. A distinct ear is only to be found in some species.

The ARACHNIDES form the third class of the Articulata. Their head and thorax, as in many of the Crustacea, are united in one single piece, furnished, on each side, with articulated limbs; but their principal viscera are inclosed in an abdomen connected to the posterior portion of that thorax. Their mouth is armed with jaws, and their head furnished with simple eyes, that vary as to number, but the antennæ are always wanting. Their circulation is effected by a dorsal vessel, which gives off arterial branches, and receives venous ones from them; but their mode of respiration varies, some of them still having true pulmonary organs which open on the sides of the abdomen, while others receive air by tracheæ, like Insects. In both of them, however, we observe lateral openings or true stigmata.

The **Insecta** constitute the fourth class of the Articulata, and the most numerous of all the animal kingdom. With the exception of some genera, the Myriapoda, in which the body is divided into numerous and nearly equal parts, it is always divided into three portions: the head, furnished with the antennæ, eyes and mouth; the thorax, to which are appended the feet and wings, when they exist; and the abdomen, which is suspended behind the thorax and contains the principal viscera. Those which have wings, only receive them at a certain age, and frequently pass through two more or less different forms before they assume that of the winged insect. In all their states they respire by tracheæ; that is, by elastic vessels which receive air through stigmata pierced on their sides, and distribute it by infinite ramifications to every part of the body. A vestige of a heart only is perceptible, consisting of a dorsal vessel which experiences an alternate contraction and dilatation, but to which no branch has ever been discovered, so that we are forced to believe that nutrition is effected in this class of animals by imbibition. It is, probably, this sort of nutrition which necessitated the kind of respiration proper to insects; for as the nutritive fluid is not contained in vessels(1), and could not be directed towards pulmonary organs in search of air, it was requisite that this air should be diffused throughout the body to reach the fluid. This is also the reason why insects have no secretory glands, but are provided with mere spongy vessels, which, by the extent of their surface, appear to absorb the peculiar juices they are to produce, from the mass of the nutritive fluid(1).

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(1) M. Carus has observed regular movements in the fluid which fills the tubes of certain larvæ of Insects, but this movement does not take place in a system of closed vessels, as in the superior animals. See his treatise entitled "*Discovery of a simple circulation of the blood*, &c." in German, Leipzig, 1827, 4to.

Insects vary infinitely as to the form of the organs of the mouth, and those of digestion, as well as in their industry and mode of life; the sexes are always separated.

The Crustacea and Arachnides were long united with the Insecta under one common name, and resemble them in many points of their external form, in the disposition of their organs of motion, and of the sensations, and even in those of manducation.

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(1) On this subject see my Memoir on the nutrition of Insects, printed 1799, Mem. de la Soc. d'Hist. Nat. de Paris. Baudouin, an vii, 4to, p. 32.

CLASS I.

ANNELIDES(1).

The Annelides are the only invertebrate animals that have red blood. It circulates in a double system of complicated vessels(2).

Their nervous system consists in a double knotted cord, like that of insects.

Their body is soft, more or less elongated, and divided into a, frequently, considerable number of segments, or at least of transverse plicæ.

They nearly all inhabit the water—the Lumbrici or Earthworms excepted; several penetrate into holes at the bottom, or construct tubes there with the ooze or other matters, or even exude a calcareous substance, which envelopes them with a sort of tubular shell.

Division of the Annelides into three Orders.

This class, which contains but few species, presents a sufficient basis of division in its organs of respiration.

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(1) I established this class, distinguishing it by the colour of its blood and other attributes, in a Memoir read before the Institute in 1802. See Bullet. des Sc., Mesidor, an X, where I described the organs of the circulation.

M. Lamarck has adopted and named it *Annelides*. Brugières previously united it to the order of the intestinal worms, and before him, Linnæus placed part of these animals among the Mollusca, and the rest among the Intestini.

(2) It has been asserted that the blood of the Aphroditæ is not red. I think I have observed the contrary in the *Aphrodita squamata*.

The branchiæ of some resemble tufts or arbusculæ, attached to the head or anterior part of the body: they, nearly all, inhabit tubes. We will call them the TUBICOLÆ.

Those of others resemble trees, tufts, laminæ or tubercles in which vessels ramify, and are placed on the middle of the body: most of them inhabit mud or swim in the ocean, the smaller portion being furnished with tubes. We name them the DORSIBRANCHIATÆ.

Others again have no apparent branchiæ, and respire, either by the surface of the skin, or as some authors opine, by the internal cavities. Most of them live free in mud or water; some of them only, in humid earth. They are the ABRANCHIATÆ.

The genera of the first two orders are all furnished with stiff setæ, of a metallic colour, that issue from their sides, sometimes simply, and at others in fasciculi, which serve in lieu of feet; but there are some genera in the third order which are deprived of that support(1).

The special attention paid by M. Savigny to these feet or organs of locomotion, has resulted in the distinction of the following parts: 1. The foot itself, or the tubercle which supports the setæ; sometimes there is but one to each ring, and at others there are two, one above the other, styled a simple or double oar. 2. The setæ, which compose a fasciculus for each oar, and which vary greatly in form and consistence, sometimes constituting true spines, and at others fine and flexible hairs, frequently dentated, barbed, &c.(2) 3. The cirri or fleshy filaments adhering to the foot, either above or beneath.

The head of the Annelides of the two first orders is generally furnished with tentacula or filaments, to which, notwithstanding their fleshy nature, some modern naturalists give the name of antennæ; and several genera of the second and third are marked with black and shining points, usually considered as eyes. The organization of their mouth varies greatly.

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(1) M. Savigny has proposed a division of the Annelides, to be founded on the presence or absence of these locomotory setæ; those in which they are wanting being reduced to Leeches. M. de Blainville, who has adopted this idea, forms his class of the ENTOMOZOARIÆ CHETOPODES with the Annelides with setæ, and that of the ENTOMOZOARIÆ APODES with those which have none, but in mixing many of the Intestini with the Apodes, he has done what M. S. did not do.

(2) See on this subject the Mem. of M. Savighy on the invertebrate animals, and those of Messrs Audouin and M. Edwards on the *Annelides*.

ORDER I.

TUBICOLÆ(1).

Some of the Tubicolæ form a calcareous, homogeneous tube, probably the result of transudation, like the shell of the Mollusca, with which however they have no muscular adhesion; others construct one by agglutinating grains of sand, fragments of shells and particles of mud, by means of a membrane, also unquestionably transuded; the tube of others again is entirely membranous or horny. To the first belongs the genus

Serpula, Lin.

The calcareous tubes of the Serpulæ twine round and cover stones, shells, and all submarine bodies. The section of these tubes is sometimes round, and sometimes angular, according to the species.

The body of the animal is composed of numerous segments; its anterior portion is spread into a disk, armed on each side with several bundles of coarse hairs, and on each side of its mouth is a tuft of branchiæ, shaped like a fan, and usually tinged with bright colours. At the base of each tuft is a fleshy filament, one of which, either on the right or left, indifferently, is always elongated, and dilated at its extremity into a variously formed disk which serves as an operculum, and seals up the orifice of the tube when the animal has withdrawn into it(1).

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(1) M. Savigny adds the *Arenicolæ* to this order, and changes its name to Serpulacea; M. Lamarck, adopting his plan, converts the Serpulacea into Sedentaria. The genera of my *Tubicolæ* form the family of the Amphitrites, Savigny, and those of the Amphitritæa and Serpulacea, Lamarck. They form the order Entomozoaria Chætopoda Heterocrisina, Blainville, who, in defiance of his own definition, places there Spio and Polydorus.

Serp. contortuplicata(2), Ell., Corall., XXXVIII, 2. The most common species; its tubes are round, three lines in diameter, and twisted. The operculum is infundibuliform, and the branchiæ are frequently of a beautiful red colour, or variegated with yellow, violet, &c. Vases or other objects thrown into the sea are soon covered by its tubes.

Serp. vermicularis, Gm.; Mull., Zool. Dan., LXXXVI, 7, 9, &c. A smaller species, with a claviform operculum, armed with two or three small points. The branchiæ are sometimes blue. No spectacle is more beautiful than that of a group of these Serpulæ when well expanded. They are found on the coast of France.

In others the operculum is flat and bristled with more numerous points(3). One of them is the

Serp. gigantea, Pall., Miscel., X, 2, 10. It is always found among the Madrepores, which frequently surround its tube; the branchiæ become spirally convoluted when they enter the latter, and its operculum is armed with two small branching horns, resembling the antlers of a deer(4). M. Lamarck distinguishes the

SPIRORBIS, Lam.,

Where the branchial filaments are much less numerous—three or four on each side; the tube is regularly spiral, and the animal usually very small(5).

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(1) The disk of the common Serpula being funnel-shaped, has induced naturalists to consider it as a proboscis, but it is not perforated, and in all the other species it is more or less claviform.

(2) It is the same animal as the *Amphitrite penicillus*, Gm., or *Proboscidea*, Brug., or *Probosciplectanos*, Fab. Column. Aquat., c, xi, p. 22.

(3) They are the GALEOLARIÆ, Lam. A single operculum is seen, Berl., Schr., IX, iii, 6.

(4) The same as the *Terebella bicornis*, Abildg., Berl. Schr., IX, iii, 4; Seb., III, xvi, 7, and as the *Actinia*, or *Animal-flower*, Home, Lect. on Comp. Anatom., II, pl. 1. M. Savigny established his subdivision of the SERPULÆ CYMOSPIRÆ, of which M. de Blainville has since made a genus, upon this spiral convolution of the branchiæ.

Add, *Terebella stellata*, Gm., Abildg., loc. cit. f. 5, remarkable for its operculum, which is composed of three plates strung together.

(5) *Serpula spirillum*, Pall., Nov. Act. Petrop., V, pl. v, f. 21;—*Serp. spirorbis*, Mull., Zool. Dan. III, lxxxvi, 1—6.

SABELLA, Cuv.(1)

The same kind of body, and similar flabelliform branchiæ, as the Serpulæ; but the two fleshy filaments adhering to these branchiæ both terminate in a point, and without forming an operculum; sometimes they are even wanting. The tube of the Sabellæ is most commonly composed of granules of clay or mud, and is rarely calcareous.

The species known are large, and their fan-like branchiæ remarkable for their delicacy and brilliancy.

Some of them, like the Serpulæ, have a membranous disk on the anterior part of the back, through which pass the first pairs of the bundles of setæ; their pectiniform branchiæ are spirally contorted, and their tentacula reduced to slight folds(2).

> *Sab. protula*, Cuv.; *Protula Rudolphii*, Risso. A large and splendid species inhabiting the Mediterranean. Its tube is calcareous like that of the Serpulæ, its branchiæ orange coloured, &c.(3)

Others have no membranous disk anteriorly; their two pectiniform branchiæ are equal and spiral(4).

There are sometimes two ranges of filaments on each comb(5).

In others again, only one of the two combs is thus formed; the other, which is smaller, enveloping the base of the first,—*Sabella unispira*, Cuv.; *Spirographis Spallanzanii*, Viviani, Phosph. Mar., pl. iv, v(6).

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(1) This name, in the works of Linnæus and Gmelin, designates various animals with factitious, and not transuded, tubes: we restrict its application to those which resemble each other in their peculiar characters. M. Savigny employs it in the latter way, our first division excepted, which he places among his Serpulæ. Our Sabellæ are the AMPHITRITES of Lamarck.

(2) This division is left by M. Savigny among the Serpulæ, and constitutes his SERPULÆ SPIRAMELLÆ, of which M. de Blainville has since made his genus SPIRAMELLA.

(3) The existence of this magnificent species, and the calcareous nature of its tube, are incontestable, notwithstanding the doubt expressed in the Dict. des Sc. Nat., LVII, p. 443, note. The *Sabella bispiralis*,—*Amphitrite volutacornis*, Lin. Trans., VII, vii, differs but slightly from it. I dare not assert it is the same as Seb., I, xxix, 1, erroneously cited by Pallas and Gmelin under *Serpula gigantea*, for that figure shows no disk.

(4) The simple SABELLÆ of Savigny, *Amphitrite reniformis*, Mull., Ver., XVI, or *Tubularia penicillus*, Id., Zool., lxxxix, 1, 2, or *Terebella reniformis*, Gm. —*Amph. infundibulum*, Montag., Lin. Trans., IX, viii;—*Amph. vesiculosa*, Id. Ib., XI, v.

(5) The SABELLÆ ASTARTÆ, Savig., such as the *Sabella grandis*, Cuv., or *Indica*, Sav.;—*Tubularia magnifica*, Shaw, Lin. Trans., V, ix.

(6) The SABELLÆ SPIROGRAPHICÆ, Savigny.

There are some whose branchiæ merely form a simple funnel round the mouth; their filaments, however, are numerous, crowded, and strongly ciliated on the internal surface(1). Their silky feet are almost imperceptible.

Finally, others have been described which have but six filaments, arranged in a stellate form(2).

TEREBELLA, Cuv.(3)

The Terebellæ, like most of the Sabellæ, inhabit an artificial tube, but it is composed of grains of sand and fragments of shells; their body, moreover, has fewer rings, and their head is otherwise decorated. Numerous filiform and extremely extensible tentacula surround their mouth; their branchiæ, placed on the neck, are not infundibuliform, but resemble arbusculæ.

Several species are found on the coast of France, long confounded under the name of *Terebella conchilega*, Gm., Pall., Miscel., IX, 14—22, most of which are remarkable for tubes formed of large fragments of shells, the edges of their opening being prolonged into several little branches, composed of similar materials, and containing the tentacula.

In the greater number there are three pairs of branchiæ, which, in those where the tube is branched, issue through a peculiar hole formed for that purpose(4).

N.B. On account of the imperfection of the figure of Ellis, Coral., pl. xxxiii, I do not know to which of these subdivisions we should refer the *Amphitrite ventilubrum*, Gm., or *Sabella penicillus*, L., Ed. XII.

(1) *Sab. villosa*, Cuv., a new species.

(2) *Tubularia Fabricia*, Gm., Fabr., Faun. Grœnl., p. 450—the genus FABRICIA, Blainv.

(3) Linnæus, in his twelfth edition, had thus named an animal described by Kæhler, and which might have belonged to this genus because it was thought to perforate stones. Lamarck has employed the same name—An. sans vert., p. 324, for a *Nereis* and for a *Spio*. The *Terebellæ*, Gm., comprehend *Amphinomæ*, *Nereides*, *Serpulæ*, &c. Messrs Savigny, Montag., Lamarck, and Blainville, employ this name as above, which was proposed by me, Dict. des Sc. Nat., II, p. 79.

(4) They are the simple TEREBELLÆ of Savigny, such as: *Tereb. medusa*, Sav., Eg., Annel., I, f. 3;—*Ter. cirrhata*, Gm., Mull., Ver., XV;—*Ter. gigantea*, Montag., Lin. Trans., XII, 11;—*T. nebulosa*, Id. Ib., 12, 2;—*T. constrictor*, Id. Ib., 13, 1;—*T. venusta*, Ib., 2; he also calls one of them *T. cirrhata*, Ib., XII, 1; but which does not appear to be the same as that of Muller. Add *T. variabilis*, Risso, &c.

N.B. M. Savigny makes two other divisions of Terebellæ, the T. PHYZELIÆ, which have but two pairs of branchiæ, and the T. IDALIÆ, that have but one pair. Among the latter would come the *Amphitrite cristata*, Mull., Zool. Dan., lxxi, 1, 4; *Amph. ventricosa*, Bosc., Ver., I, vi, 4—6.

AMPHITRITE, Cuv.(1)

The Amphitrites are easily recognized by the golden coloured setæ, arranged like a crown, or the teeth of a comb, in one or two rows, on the anterior part of their head, where they probably serve as a means of defence, or perhaps enable the animal to crawl, or to collect the materials of its tube. Numerous tentacula encircle the mouth, and on each side of the fore part of the back are pectiniform branchiæ.

Some of them construct light tubes of a regularly conical figure, which they carry about with them. Their gilded setæ form two combs, whose teeth incline downwards. Their capacious and frequently flexed intestine is usually filled with sand(2). Such is the

Amph. auricoma belgica, Gm.; Pall., Miscel., IX, 3—5. Its tube is two inches long, and formed of variously coloured round granules(3).

Amph. auricoma capensis, Pall., Miscel., IX, i, 2. From the South seas; its thin and polished tube appears to be transversely fibrous, and formed of some desiccated, soft, and stringy substance. It is a larger species(4).

There are others which inhabit artificial tubes fixed to various bodies. Their gilded setæ form several concentric crowns on their head, from which results an operculum that seals up their tube when they contract, but the two parts of which can separate. Each foot is furnished with a cirrus. The body is terminated behind in a tube bent towards the head, which doubtless affords an issue to the fæces. I have found a muscular gizzard in them(1).

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(1) This genus, as it stands in Muller, Brugières, Gmelin, and Lamarck, also includes some *Terebellæ* and *Sabellæ*. In 1824, Dict. des Sc. Nat. II, p. 78, I reduced it to its actual limits; since then, M. Lamarck has changed my divisions into genera, his PECTINARIÆ and SABELLARIÆ, termed AMPHICTENÆ and HERMELLÆ by Savigny. The AMPHITRITES of Lamarck are my SABELLÆ. M. Savigny, on the contrary, makes it the name of a family.

(2) They are the PECTINARIÆ, Lam.; AMPHICTENÆ, Savig.; CHRYSODONTES, Oken; and the CISTENÆ of Leach. This perpetual changing of names—and in this particular case there was not even the pretext of a change of limits in the group—will finally end in rendering nomenclature a much more difficult study than that of facts.

(3) The same as the *Sabella belgica*, Gm., Klein., tab. I, 5, Echinod., xxxiii, A, B, and as the *Amph. auricoma*, Mull., Zool. Dan. xxvi, of which Brugières has made his *Amphitrite dorée*.

(4) The same as the *Sabella chrysodon*, Gm., Berg., Stock. Mem., 1765, IX, 1, 3; as the *Sabella capensis*, Id., Stat., Mull., Nat. Syst., VI, xix, 67, which is a mere copy of Bergius; as the *Sabella indica*, Abildgaardt, Berl. Schr., IX, iv. See also Slabber, Fless. Mem., I, ii, 1—3.

Such is the species found along the coast of France, the *Sabella alveolata*, Gm.; *Tubipora arenosa*, L.; Ed. XII, Coral., XXXVI. Its tubes, united in one compact mass, have their orifices regularly arranged like the cells of a honey-comb(2). Another, the

Amph. ostrearia, Cuv., establishes its tubes on the shells of Oysters, and it is said greatly hinders their propagation.

It is to this order I suspect that we must refer the

SYPHOSTOMA, Otto,

Where, on the superior part of each articulation, is inserted a fasciculus of fine setæ, and on the inferior a simple seta, and on the anterior extremity two fasciculi of strong golden coloured setæ. Under these setaceous appendages is the mouth, preceded by a sucker surrounded by numerous soft filaments, which may very possibly be branchiæ, and accompanied by two fleshy tentacula. The knotted medullary cord is seen through the skin. They live buried in mud(3). Hitherto, the genus

DENTALIUM, Lin.

Has always been placed in this vicinity. The shell is an elongated, arcuated cone open at both ends, and has been compared to the tusk of an elephant in miniature. The recent observations of M. Savigny and those of M. Deshayes especially(4), have, however, rendered this classification extremely doubtful.

The animal of the Dentalia has neither any sensible articulation nor lateral setæ, but is furnished anteriorly with a membranous tube, inside of which is a sort of foot or fleshy and conical operculum which closes its orifice. On the base of this foot is a small flattened head, and plumose branchiæ are observed on the nape. If the operculum recall to our minds the foot of the Vermeti and Siliquariæ, which have been placed among the Mollusca, the branchiæ strongly remind us of those of the Amphitrites and Terebellæ. Ulterior observations upon their anatomy, and principally upon that of their nervous and vascular system, will resolve this problem.

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(1) The SABELLARIÆ, Lam.; the HERMELLÆ, Savigny.

(2) This is perhaps the place for the *Amphitrite plumosa* of Fab., Faun. Grœnl., p. 288, and Mull., Zool. Dan., xc; but their descriptions are so obscure, and agree so little with each other, that I dare not attempt to assign it. It forms the genus PHERUSA, Blainville.

(3) *Siphostoma diplochaitos*, Otto;—*Siph. uncinata*, Aud. and Edw., Litt., de la Fr., Annel., pl. ix, f. 1.

(4) Monograph of the genus DENTALIUM, Mem. de la Soc. d'Hist. Nat. de Paris, t. II, p. 321.

The shell of some of them is angular(1), or longitudinally striated(2).

That of others is round(3).

ORDER II.

DORSIBRANCHIATÆ.

The organs of the Dorsibranchiatæ, and the branchiæ in particular, are equally distributed along the whole of the body, or at least of its middle portion.

At the head of the order we will place those genera in which the organs are most completely developed.

Arenicola, Lam.(4)

Branchiæ, resembling small trees, on the rings of the middle part of the body only; the mouth, a fleshy and more or less dilatable proboscis, and neither teeth, tentacula nor eyes visible. The posterior extremity not only wants the branchiæ, but the setaceous fasciculi with which the rest of the body is furnished; the cirri totally deficient.

Aren. piscatorum, Lam.; *Lumbricus marinus*, L.; Pall. Nov. Act. Petrop., ii, 1, 19—29. Very common in the sand on the sea shore, where it is disinterred by the fishermen, who use it as bait. It is about a foot long, of a reddish colour, and diffuses an abundant yellowish liquid when touched. It has thirteen pairs of branchiæ(1).

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(1) *Dent. elephantium*, Martini, I, 1, 5, A;—*Dent. aprinum*, Ib., 4, A;—*D. striatulum*, Ib., 5, B;—*D. arcuatum*, Gualt., X, G;—*D. sexangulum*.

(2) *Dent. dentalis*, Rumpf., Mus., xli, 6;—*D. fasciatum*, Martini, Conch., I, 1, 3, B;—*D. rectum*, Gualt., X, H, &c.

(3) *Dent. entalis*, Martini, I, i, 1, 2, &c.

(4) M. Savigny has made a family of this genus by the name of Thelethusæ, which has been adopted by his successors.

Amphinome, Brug.(2)

A pair of more or less complex, tufted or plumose branchiæ on each ring of the body, and to each of the feet two fasciculi of separate setæ, and two cirri; no jaws to the proboscis. The Amphinomes are divided by M. Savigny into

Chloeia, Sav.,

Where the head is furnished with five tentacula, and the branchiæ resemble a tripinnate leaf.

The Indian ocean produces one of them, the *Amphinome chevellue*, Brug.; *Terebella flava*, Gm.; Pall., Miscell. VIII, 7—11, very remarkable for its long bundles of lemon-coloured setæ, and the beautiful purple plumes of its branchiæ. Its form is broad and depressed, and it has a vertical crest on the snout.

And into the

Pleione, Sav.—Amphinome, Blainv.,

Where, with the same tentacula, the branchiæ are tufted. The Pleiones are also from the Indian ocean, and some of them are very large(3). To these he adds the

Euphrosine, Sav.(4)

Where the head has but a single tentaculum, and the tree-like branchiæ are very complex and greatly developed. To this subgenus, Messrs Audouin and Edwárds approximate the

Hipponoe,

Which has no caruncle, and but a single bundle of setæ, and a single cirrus to each foot.

Hip. Gaudichaudii, Ann. des Sc. Nat. t. XVIII, pl. vi. A species from Port Jackson. In the

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(1) Add *Arenicola clavata*, Ranzani, dec. I, p. 6, pl. i, f. 1, should it prove to be a distinct species.

(2) This genus has very properly been withdrawn by Brugières, from the APHRODITÆ of Pallas and the TEREBELLÆ of Gmelin. It forms the type of M. Savigny's family of the AMPHINOMÆ, also adopted by his successors.

(3) *Terebella caruncidata*, Gm., *Amph. car.*, Pall., Miscell., VIII, 12—13;—*Ter. rostrata*, 14—18;—*Ter. complanata*, Ib., 19—26;—*Pleione alcyonia*, Sav., Eg., Annel., II, f. 3.

(4) *Euphrosine laureata*, Id. Ib., f. 1;—*E. mirtosa*, Id., Ib., 2.

N.B. The genus ARISTENIA, Sav., Eg., Annel., pl. ii, f. 4, should also come near the Amphinomes; but it is only established on a mutilated specimen.

EUNICE, Cuv.(1).

The branchiæ are also plumose, but the proboscis is well armed with three pair of differently formed horny jaws; each foot is furnished with two cirri and a bundle of setæ, there are five tentacula above the mouth and two on the nape. In some species only do we find two small eyes.

Eun. gigantea, Cuv. The largest of the known Annelides, being upwards of four feet in length. From the sea of the Antilles.

Several smaller species are found on the coast of France(2).

By the name of MARPHISÆ, M. Savigny distinguishes those species, otherwise very similar, in which the two tentacula on the nape are wanting; their upper cirrus is very short(3).

A species at least closely allied to them,—*N. tubicola*, Mull., Zool. Dan., I, xviii, 1—5, inhabits a horny tube(4).

After these genera with complex branchiæ, we may place those where they are reduced to simple laminæ or slight tubercles, or in which they are even replaced by cirri.

Some of them are still allied to the Eunices, by the strong armature of their proboscis, and their azygous antennæ. Such is the

LYSIDICE, Sav.

Where, with jaws similar to those of the Eunices, and even more numerous and frequently azygous, the only branchiæ consist of three tentacula and the cirri(5).

AGLAURA, Sav.

The jaws of the Aglauræ are also numerous and azygous, consisting of seven, nine, &c.; but their tentacula are either wanting or completely concealed; their branchiæ are also reduced to cirri(1).

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(1) *Eunice*, the name of a Nereis in Apollodorus. M. Savigny makes it the name of a family, and calls the genus *Leodice*. M. de Blainville has changed these names, first to *Branchionereis*, and then to *Nereidon*.

(2) *Nereis norvegica*, Gm., Mull., Zool. Dan., I, xxix, 1;—*N. pinnata*, Ib., 2;—*N. cuprea*, Bosc., Ver., I, v, 1;—*Leodice gallica*, and *L. hispanica*, Savig.—Ad.? *Leod. antennata*, Sav., Annel., V, 1;—*Eunice bellii*, Aud., and Edw., Litt. de la Fr., Annel., pl. iii, f. 1—4;—*Eun. harassii*, Ib., f. v, 11.

(3) *Nereis sanguinea*, Montag., Lin. Trans., XI, pl. 3.

(4) After the Eunices probably should come the *Nereis crassa*, Mull., Ver., pl. xii, which, without having seen it, M. de Blainville proposes to refer to the genus ETEONE, Sav., although the branchiæ of the latter are very different.

(5) *Lysidice Valentina*, Sav.;—*L. Olympia*, Id.;—*L. galatina*, Id., Eg., Annel., p. 53.

Nereis, Cuv.—Lycoris, Sav.

The true Nereides have an even number of tentacula, attached to the sides of the base of the head, and a little further forwards two others that are biarticulate, between which are two simple ones. Their branchiæ consist of small laminæ between which is spread a network of vessels; each foot is also furnished with two tubercles, two fasciculi of setæ, one cirrus above, and another beneath.

Several species inhabit the coast of France(2).

In the vicinity of these Nereides are grouped several genera in which the body is also slender, and the branchiæ are reduced to simple laminæ, or even simple filaments or tubercles. The jaws or tentacula are wanting in some of them.

Phyrlodoce, Sav.—Nereiphylla, Blainv.

The Phyllodoces, like the true Nereides, have an even number of tentacula on the sides of the head, and four or five small additional ones before. They are furnished with eyes; their large proboscis, which is studded with a circle of very short fleshy tubercles, presents no jaws, and, what particularly distinguishes them, their branchiæ resemble broad leaves, arranged in a single row on each side of the body, and overlapping each other; finely ramified vessels are distributed over them(3).

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(1) I unite the Aglauræ and Œnones, Sav., and even certain species without tentacula, left among the Lysidices by Messrs Audouin and Edwards; *Aglaura fulgida*, Eg. Annel., V, 2;—*Œnone lucida*, Ib., f. 3.

(2) *Nereis versicolor*, Gm., Mull., Wurm., VI;—*N. fimbriata*, Id., viii, 1—3;—*N. pelagica*, Id., vii, 1—3;—*Terebella rubra*, Gm., Bommé, Mém. de Fless., VI, 357, f. 4, A, B;—*Lycoris ægyptia*, Eg., Annel., pl. iv, f. 1;—*Lycoris nuntia*, Id. Ib. f. 2;—*Nereis beaucoudrasii*, Aud., and Edw., Littor. de la Fr., Annel., pl. iv, f. 1—7;—*Ner. pulsatoria*, Ib., f. 8—13.

N.B. The *Nereis verrucosa*, Mull., Ver., pl. vii, and *incisa*, Ott., Fabr., Soc. Hist. Nat. Copenhag., V, part I, pl. iv, f. 1—3, seem to have the head of a Lycoris, but with long filaments in place of branchiæ: they require examination.

(3) *Nereis lamellifera atlantica*, Pall., Nov. Act. Petrop., II, pl. v, f. 11—18, perhaps the same as the *Nereiphylle de Pareto*, Blainv., Dict. des Sc. Nat.;—*N. flava*, Ott., Fabr., Soc. Hist. Nat. Copenhag., V, part I, pl. iv, f. 8—10.

N.B. The *N. viridis*, Mull., Ver., pl. xi, of which, without having seen it, M. Savigny proposes to make the genus Eulalia, and the two Eunomiæ, Risso, Europ. Merid., IV, p. 420, also appear to me to be Phyllodoces; perhaps we should also so consider the *Nereis pinnigera*, Montag., Lin. Trans., IX, vi, 3; and the

Alciopa, Aud. and M. Edw.

The mouth and tentacula nearly similar to those of the Phyllodoces; but the feet, independently of the tubercle which supports the setæ and the two foliaceous cirri or branchiæ, are furnished with two branchial tubercles which occupy their superior and inferior edges(1).

Spio, Fab. and Gm.

The body slender; two very long tentacula which have the appearance of antennæ; eyes in the head and on each side of every segment of the body; branchiæ in the form of a simple filament. They are small worms from the Arctic Ocean that inhabit membranous tubes(2).

Syllis, Sav.

An odd number of tentacula articulated like the beads of a rosary, as well as the superior cirri of the feet, which are simple and have but a single bundle of setæ. It appears that there is some variety relative to the existence of the jaws(3).

Glycera, Sav.

The Glyceræ are recognized by their head, which is a fleshy and conical point resembling a small horn, and divided at the summit

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Nereis stellifera, Mull., Zool. Dan., pl. lxii, f. 1, of which, without having seen it, Savigny proposes to make a genus by the name of Lepidia; and the *N. longa*, Ott., Fabr., placed by Savig. with the *N. flava* in his genus Eteone: All these Annelides require to be carefully examined according to the detailed method of M. Savigny.

We must not confound these Phyllodoces of Savigny with those of Ranzani, which are allied to the Aphroditæ, and particularly to the Polynoes.

(1) *Alciopa Reynaudii*, Aud., and Edw.,—from the Atlantic Ocean.—The pretended *Nais Rathke*, Soc. Hist. Nat. Copen., V, part I, pl. iii, f. 15, may very possibly be an Alciopa.

(2) *Spio seticornis*, Ott., Fabr., Berl., Schr., VI, v, 1—7;—*Spio filicornis*, Ib., 8—12. The Polydoræ, Bosc., Ver. I, v, 7, appear to me to belong to this genus. *Spio*, the name of a Nereid.

(3) *Syllis monilaris*, Sav., Eg., Annel., IV, f. 3, copied Dict. des Sc. Nat. N.B. The *Nereis armillaris*, Mull., Ver., pl. ix, of which, without having seen it, M. Savigny proposes to make the genus Lycastis, has tentacula and cirri formed like a rosary as in Syllis, but the tentacula are represented as being in even numbers. It should be examined.

into four scarcely visible tentacula. The proboscis of some still presents jaws, in others, they are said to be imperceptible(1).

Nephthys, Cuv.

The proboscis of the Phyllodoces but no tentacula; two bundles of widely separated setæ on each foot, between which is a cirrus(2).

Lumbrinera, Blainv.

The tentacula wanting; but a single small forked tubercle, from which issues a little bundle of setæ, on each articulation of the elongated body. If there be any external organ of respiration, it can only consist of an upper lobe of this tubercle(3).

Aricia, Sav.

The teeth and tentacula wanting; two ranges of lamellated cirri on the back of the elongated body; anterior feet furnished with notched crests not found on the others(4).

Several species of these genera are found on the Atlantic coast of France.

Hesione, Lam.

A short thick body composed of but few and feebly marked rings; a very long cirrus, that probably exercises the functions of branchiæ, on the top of each foot, which has another beneath with a bundle of setæ; a large proboscis with neither tentacula nor jaws.

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(1) *Nereis alba*, Mull., Zool. Dan., lxxii, 6, 7;—*Glyc. Meckelii*, Aud., and Edw., Littor. de la Fr., Annel., pl. vi, f. 1.

(2) *Nephthys Hombergii*, Cuv., Dict. des Sc. Nat.

(3) *Nereis ebranchiata*, Pall. Nov. Act. Petrop., II, pl. vi, f. 2;—*Lombrinère brilliant*, Blainv., pl., of the Dict. des Sc. Nat.;—*Lumbricus fragilis*, Mull., Zool. Dan., pl. xxii, of which, but with hesitation, M. de Blainville makes his genus Scoletoma.

N.B. The Scololepes, Blainv., which are only known by the fig. of Abildgaardt (*Lumbricus squamatus*, Zool. Dan., IV, clv, 1—5), have a very slender body with numerous rings, each furnished with a branchial cirrus and two bundles of setæ, the inferior of which seems to proceed from a fold of the skin compressed like a scale; their head has neither jaws nor tentacula.

(4) *Aricia Cuvieri*, Aud., and Edw., Litt., de la Fr., Annel., pl. vii, f. 5—13.

The *Lumbricus armiger*, Mull., Zool. Dan., pl. xxii, f. 4 and 5, of which, without having seen it, M. de Blainville proposes to form a genus by the name of Scolople, appears to want both teeth and tentacula, and to have simple small bundles of short setæ on its first segments, and a bifid wart, a small seta, and a long pointed branchial lamina on the others.

Several species are found in the Mediterranean(1).

Ophelina, Sav.

The body thick and short, with feebly marked rings and scarcely visible setæ; long cirri in lieu of branchiæ on two thirds of its length; palate of the mouth with a dentated crest; the lips surrounded with tentacula, of which the two superior are the largest(2).

Cirrhatulus, Lam.

The branchiæ consisting of a very long filament; two small bundles of setæ to each of the articulations of the body, which are numerous and compact; a series of long filaments round the nape. The slightly marked head has neither tentacula nor jaws(3).

Palmyra, Sav.

The Palmyræ are recognized by their superior fasciculi, the setæ of which are large, flattened, flabelliform, and glisten like highly polished gold; their inferior fasciculi are small; their cirri and branchiæ feebly marked. They have an elongated body, two extended tentacula, and three very small ones.

Palm. aurifera, Sav. The only species known; it is from one to two inches in length, and is found at the isle of France.

Aphrodita, Lin.

This genus is easily known by the two longitudinal ranges of broad membranous scales that cover the back, to which, through a very groundless assimilation, the name of elytra has been given, and under which, their branchiæ, in the form of fleshy crests, are concealed.

Their body is usually flattened, and shorter and broader than in the other Annelides. Their extremely thick and muscular esophagus is susceptible of being protruded like a proboscis; their intestine is unequal, and furnished on each side with numerous branched cæca, the extremities of which are fixed between the bases of the setaceous fasciculi, which serve as feet. M. Savigny distinguishes from them the

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(1) *Hesione splendida*, Sav., Eg., Annel., pl. iii, f. 3;—*H. festiva*, Id., Ib., p. 41;—*H. pantherina*, Risso, Eur. Merid., IV, p. 418.

(2) This is probably the place for the *Nereis prismatica*, and *bifrons*, Fabr., Soc. Hist. Nat. Copen. V, part I, pl. iv, p. 17—23.

(3) *Lumbricus cirrhatus*, Ott., Fabr., Faun. Grœnl., f. 5, from which the *Terebella tentaculata*, Montag., Lin. Trans., IX, and the *Cirrhinère filigère*, Blainv., pl., of the Dict. des Sc. Nat., N, do not appear to differ as to the genus;—*Cirrh. Lamarkii*, Aud., and Edw., Litt., de la Fr., Annel., pl. vii, f. 1—4.

Halithea, Sav.

Where there are three tentacula, a small crest between two of them, and where the jaws are wanting.

A species is found on the coast of France, which, with respect to its colouring, is one of the most splendid of all animals—the *Aphrodita aculeata*, L. Pall., Misc., VII, 1—13. It is oval, from six to eight inches in length, and from two to three in breadth. The scales on its back are covered and concealed by a sort of stuff resembling tow, which arises from the sides. From the latter also spring groups of stout spines, which partly transfix the tow, and fasciculi of flexuous setæ of a splendid golden colour, whose changeable tints rival those of the rainbow. They are not inferior in beauty to the plumage of the Hummingbird, or to the lustre of the richest gems. Further down is a tubercle from which arise three groups of spines, of as many different diameters, and finally, a fleshy cone. There are forty of these tubercles on each side, and between the two first are two small fleshy tentacula. There are fifteen pairs of wide, and sometimes inflated scales on the back, and fifteen small branchial crests on each side.

Some of these Halitheæ have none of this tow-like material on the back(1): one species—*Aphr. hystrix*, Sav.(2), is found in the seas of Europe. A second subdivision of the Aphroditæ is that of the

Polynoe, Sav.—Eumolpe, Oken.

Where there is none of this tow on the back; they have five tentacula, and their proboscis is furnished with strong and horny jaws.

Several small species are found on the coasts of France(3).

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(1) They are the *Halithées hermiones* of Savigny, of which M. de Blainville has made his genus HERMIONE.

(2) Littoral de la France, Annel., pl. i, f. 1—9.

(3) *Aphr. squamata*, Pall., Misc., Zool., VII, 14; Littor., de la Fr., Annel., pl. i, f. 10—16;—*Polyn. lævis*, Aud., and Edw., Ib., pl. ii, f. 11—18;—*Aphr. punctata*, Mull., Ver., XIII;—*Aphr. cirrhosa*, Pall., Misc. Zool., VIII, 3—6;—*Aphr. lepidota*, Id., Ib., 1, 2;—*Aphr. clava*, Montag., Lin. Trans., IX, vii, which is at least closely allied to the *Aphr. plana*, Mull., Ver., XIX;—*Polynoe impatiens*, Sav., Eg., Annel., pl. 3, f. 2;—*Poly. muricata*, Id., Ib., f. 1.

The SIGALIONES, Aud. and Edw., have a much more elongated form than the other Aphroditæ; each foot is furnished with cirri(1).

The ACOETES, Aud. and Edw., are provided with cirri which alternate with the elytra(2); their jaws are stronger and more deeply dentated.

A large species is found at the Antilles which inhabits a tube of the consistence of leather(3).

This is the only situation we can assign to a new and very singular genus which I call

CHÆTOPTERUS, Cuv.

The mouth has neither jaws nor proboscis, and is furnished above with a lip to which are attached two tentacula. Next comes a disk with nine pairs of feet, followed by a pair of long silky fasciculi resembling wings. The lamellated branchiæ are rather beneath the body than above it, and extend along its middle.

Chætopterus pergamentaceus, Cuv. This species, which is found at the Antilles, is from eight to ten inches in length, and inhabits a tube resembling parchment(4).

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(1) *Sigalion Mathildæ*, Aud., and Edw., Littor. de la France, Annel.

(2) *Acoëtes Pleei*, Aud., and Edw., Collect. of the Museum.

(3) N.B. The *Phyllodoce maxillosa* of Ranzani, called POLYODONTE by Reinieri, and *Eumolpe maxima* by Oken, seems to be closely allied to the ACOETES; its proboscis and jaws are the same, and neither of the genera has, perhaps, been described from perfect specimens.

There remain various Annelides so imperfectly described that we are unable to characterize them well; such are the *Nereis cæca*, Fabr., Soc. Hist. Nat. Copen. part I, pl. iv, f. 24—28;—*N. longa*, Id., Ib., f. 11—13;—*N. aphroditoïdes*, Ib., 4—7; Ib., 11—13;—*Branchiarius quadrangulatus*, Montag., Lin. Trans., XII, pl. xiv, f. 5;—*Diplotes hyalina*, Id., Ib., f. 6 and 7; and the pretended *Hirudo branchiata*, Archib. Menzies, Lin. Trans. I, pl. xvii, f. 3. I have also omitted the MYRIANÆ and two or three other genera of M. Savigny, on account of my having had no opportunity to re-examine them.

(4) It will be more minutely described by Messrs Aud., and Cuv., in the Annales des Sciences Naturelles.

ORDER III.

ABRANCHIATÆ.

The Abranchiatæ have no apparent external organ of respiration whatever, and appear to respire, some, like the Lumbrici, by the entire surface of the skin, and others, like the Hirudines, by internal cavities. They have a closed circulating system, usually filled with red blood, and, like all the Annelides, a knotted nervous cord(1). Some are also provided with setæ which enable them to crawl, and others are deprived of them. This has caused their division into two families.

FAMILY I.

ABRANCHIATÆ SETIGERÆ.

This first family comprises the Lumbrici and Naides of Linnæus.

LUMBRICUS, Lin.

The Earth-worms, as they are commonly called, characterized by a long, cylindrical body, divided by rugæ into a great number of rings, and by an edentated mouth, necessarily required to be subdivided.

LUMBRICUS, Cuv.

Eyes, tentacula, branchiæ and cirri, all wanting; a tubercle or visible enlargement, particularly sensible in the nuptial season, serves to attach the two sexes to each other in coitu. The intestine is straight and rugose, and in the anterior part of the body we observe some whitish glands which appear to be concerned in the process of generation. The Lumbrici are certainly hermaphrodites, but it is possible that their coalescing may serve to excite them to the act of self-impregnation. According to the observations of M. Montègre, the ova descend between the intestine and the external envelope to the circumference of the rectum, where they are hatched. The young ones issue, living, from the anus. M. Leon Dufour, on the contrary, affirms that their ova resemble those of the Leech. The nervous cord is nothing more than a crowded suite of numerous little ganglia(1).

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(1) For the anatomy and physiology of the abranchiate Annelides see the Memoir of *M. Ant. Dugès*, Annales des Sciences Naturelles, Sept. 1828.

M. Savigny subdivides them again.

His ENTERIONES have four pairs of small setæ, eight in all, under each ring.

Every one knows the *Common Earth-worm—Lumbricus terrestris*, L.—with a reddish body, that attains nearly a foot in length, and which is composed of upwards of one hundred and twenty rings. The tubercle is near the anterior third. Under the sixteenth ring are two pores, the use of which is unknown.

This animal traverses the soil in every direction, and swallows a quantity of earth. It also eats roots, ligneous fibres, animal fragments, &c. In the month of June it rises to the surface during the night, to seek for a companion in the process of copulation(2).

His HYPOGÆONES have, besides, an azygous seta on the back of each ring.

The only species known is from America(3).

Messrs Audouin and M. Edwards also distinguish the TROPHONIÆ, which have four bundles of short setæ on each ring, and on the anterior extremity a great number of long and brilliant setæ which surround the mouth(4).

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(1) Conf. Montègre, Mem. du Mus., I, p. 242, pl. xii, and Leon Dufour, Ann. des Sc. Nat. V, p. 17, and XIV, p. 216, and pl. xii, B, f. 1—4.

See also the treatise of Morren, *De Lumbrici Terrestris Historia Naturali nec non Anatomica*, Bruss., 1829, 4to.

(2) What is here stated is common to many species, first ascertained by M. Savigny. He has distinguished twenty of them. See my Analyse des Travaux de l'Acad. des Sc., 1821. M. Dugès distinguishes six, but does not refer them exactly to those of M. Savigny.

N.B. Muller and Fabricius speak of Lumbrici with two setæ to each ring, of which Savigny proposes to make his genus CLITELLIO, (*Lumbricus minutus*, Fab., Faun., Grœnl., f. 4), and of others with four and six setæ; but their descriptions require to be confirmed and completed ere their species can be classed.

(3) *Hypogæon hirtum*, Sav., Eg., Annel., p. 104.

(4) *Trophonia barbata*, Aud., and Edw., Littor., de la France, Annel., pl. x, f. 13—15.

NAIS, Lin.

The Naides have an elongated body, the rings of which are less distinct than in the Lumbrici. They inhabit holes made by them in the ooze, from which one half of their body projects and is constantly in motion. Black points are observed on the head of some of them, which may be taken for eyes. They are small worms, whose power of reproduction is as astonishing as that of the Hydræ. Several species are found in the rivers, &c. of France.

Some of them have long setæ(1),

And sometimes a long proboscis before(2),

Or several small tentacula at the posterior extremity(3).

Others have very short setæ(4).

Certain Annelides, hitherto referred to the Lumbrici, which construct tubes of clay, &c., in which they live, might be approximated to this genus(5).

CLYMENA, Sav.

The Clymenæ also appear to belong to this family. Their thick body has but few rings, which are mostly furnished with stout setæ; a little higher, and near the back, is a bundle of finer ones. There are neither tentacula nor appendages to the head. Their posterior extremity is truncated and radiated. They inhabit tubes(6).

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(1) *Naïs elinguis*, Mull., Wurm., II;—*N. littoralis*, Id., Zool.. Dan., lxxx.

(2) *Naïs proboscidea*, Id., Wurm., I, 1—4, of which Lamarck makes his genus STYLARIA.

(3) *Naïs digitata*, Gm., *cæca*, Mull., Ib., V, the genus PROTO, Oken.

(4) *Naïs vermicularis*, Gm., Ræs., III, xciii, 1—7;—*N. serpentina*, Id., xciii, Mull., IV, 2—4;—*Lumbricus turbifex*, Gm., Bonnet., Vers d'eau douce, III, 9, 10, Mull., Zool. Dan., lxxxiv;—*Lumbricus lineatus*, Mull., Wurm., III, 4—5.

(5) *Lumbricus tubicola*, Mull., Zool. Dan., lxxv;—*Lumb. sabellaris*, Ib., civ, 5. M. Lamarck unites them with the *Naïs tubifex*, and makes it his genus TUBIFEX; it requires, however, a new examination.

(6) *Clymena amphistoma*, Sav., Eg., Annel., pl. i, f. ;—*Cl. lumbricalis*, Ott. Fabr., Aud. and Edw., Litt., de la France, Annel., pl. x, f. 1—6;—*Cl. Ebiensis*, Aud., and Edw., Ib., f. 8—12.

FAMILY II.

ABRANCHIATÆ ASETIGERÆ.

The second family consists of two great genera, both of which are aquatic.

HIRUDO, Lin.

Leeches have an oblong, sometimes depressed, transversely plicated body; the mouth is encircled by a lip, and the posterior extremity furnished with a flattened disk, both of which are well adapted for adhering to bodies by a sort of suction, and are the principal organs of locomotion possessed by these animals; for after extending itself, the Leech fixes its anterior extremity and approximates the other which in its turn adheres to allow the former to be carried forward. In several we observe on the under part of the body two series of pores, the orifices of as many small internal pouches, considered by some naturalists as organs of respiration, although they are usually filled with a mucous fluid. The intestinal canal is straight, inflated from space to space for two-thirds of its length, where there are two cæca. The blood swallowed is preserved there, red and unchanged, for several weeks.

The ganglions of the nervous cord are much more separate than in the Lumbrici.

The Hirudines are hermaphrodites. A large penis projects from under the anterior third of the body, and the valve is a little further behind.

Several of them form their eggs into a cocoon, and envelope them them with a fibrous excretion(1).

They have been subdivided from characters principally drawn from the organs of their mouth. In the

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(1) See *Mémoires pour servir a l'Hist. Nat. des Sangues*, by P. Thomas; a Memoir of Spix, Acad. Bav., 1813; and a third of M. Carena, Acad. Turin., t. XXV; but especially the *Système des Annélides*, Savigny, and the *Monographie des Hirudines*, Moquin-Tandon, Montpellier, 1826, 4to. See also *Essai d'une Monographie de la famille des Hirudinées*, extracted from the Dict. des Sc. Nat. by M. de Blainv., Paris, 1827, 8vo, and the article SANGSUE of the same work, by Audouin.

SANGUISUGA, Sav.(1)

Or the Leech properly so called, the superior lip of the anterior cup or sucker is divided into several segments; the aperture is transverse and contains three jaws, each edge of which is armed with two rows of very fine teeth, which enables them to penetrate through the skin without causing a dangerous wound. It is marked with ten small points, considered as eyes.

We all know the medicinal or Common Leech—*Hirudo medicinalis*, L., that useful instrument for the local abstraction of blood. It is usually blackish, with yellowish streaks above, and yellowish with black spots beneath. It is found in all stagnant waters. The

HÆMOPSIS, Sav.(2)

Differs from the preceding in the teeth of its jaws, which are few and obtuse.

Hæmop. sanguisorba, Sav.; *Hirudo sanguisuga*, L., Moq. Tand., pl. iv, f. 1; Car., pl. xi, f. 7 (The Horse Leach). Much larger, and entirely greenish-black. It is said to cause dangerous wounds(3). In the

BDELLA, Sav.(4)

There are but eight eyes, and the jaws are completely edentated.

Bd. nilotica, Eg. Annel., pl. v, f. 4. Inhabits the Nile. In the

NEPHELIS, Sav.(5)

There are also but eight eyes; the interior of the mouth has but three folds of skin. Several small species are found in the stagnant waters of France; it is thought proper to distinguish from them the

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(1) M. de Blainville changes this name into JATROBELLÆ. For the various medicinal Leeches see the fig. of Messrs Carena, Acad. Turin., t. XXV, pl. xi, and Moquin-Tandon, pl. v.

(2) This name is changed by M. de Blainville to HYPOBDELLÆ.

(3) There is a singular diversity of opinion with respect to the faculty of drawing blood possessed by this animal. Linnæus says that nine of them will kill a horse. Messrs Huzard and Pelletier, on the contrary, in a Memoir, *ad hoc*, presented to the Institute, and inserted in the Journal de Pharmacie, March 1825, assert that it attacks no vertebrated animal. M. de Blainville thinks this is owing to its having been confounded with a neighbouring species, the *Sangsue noire*, which he makes the type of a genus called PSEUDOBDELLA, the jaws of which are mere folds of skin without any teeth. I think this fact worthy of examination. Both species devour the Lumbrici with avidity.

(4) M. Moquin-Tandon changes this name to LIMNATIS.

(5) M. de Blainville calls them ERPOBDELLÆ. Oken had previously named them

TROCHETIA, Dutroch.(1)

Which only differs from them in an inflation at the spot where the genital organs are placed.

One species is found in France—*Geobdella trochetii*, Blainv., Dict. des Sc. Nat., Hirud., pl. IV, f. 6, which frequently leaves the water in pursuit of Lumbrici.

M. Moquin-Tandon, under the name of AULASTOMA, even describes a subgenus, where the mouth is merely furnished with numerous longitudinal plicæ—*Aulast. nigrescens*, Moq. Tand., pl. vi, f. 4.

Immediately after the Nephelides come the BRANCHIOBDELLA, Odier, remarkable for their two jaws and the absence of eyes.

One species is known which lives on the branchiæ of the Astaci(2).

In all these subdivisions the anterior sucker is but slightly separated from the body; in the two following ones it is clearly distinguished from it by a strangulation, is composed of a single segment, and has a transverse orifice. In the

HÆMOCHARIS, Sav.(3)

In addition to this conformation, there are eight eyes, a slender body, and but slightly distinct rings. The jaws are salient, and scarcely visible points. The Hæmochares do not swim, but walk like the caterpillars called Geometræ, and adhere particularly to fishes.

One species, *Hirudo piscium*, L.; Rœsel, III, **xxxii**, is frequently observed on the Cyprini(4). The

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HELLUO. Such are: *Hir. vulgaris*, L., or *H. octoculata*, Bergm., Stock., Mem., 1757, pl. vi, f. 5—8;—*N. atomaria*, Caren., L., C, pl. xii. See also pl. vi of Moquin-Tandon.

(1) M. de Blainville changes this name to GEOBDELLA.

(2) *Branchiobdella Astaci*, Od., Mém. de la Soc. d'Hist. Nat. de Paris, t. I, pl. iv.

(3) M. de Blainville, who had named them PISCICOLÆ, a name adopted by Lamarck, has again changed it to ICTHYOBDELLA.

(4) Add, *Piscicola cephalota*, Caren., pl. xii, f. 19, and Moq. Tand., pl. vii, f. 2; —*Piscic. tesselata*, Moq. Tand., f. 3.

Albiona, Sav.(1)

Differs from the preceding subgenera in the body, which is studded with tubercles, and in having six eyes. The Albionæ inhabit the Ocean.

Alb. muricata; *Hirudo muricata*, L. A very abundant species in the seas of Europe; it is covered with small tubercles(2).

There is a parasitic animal that lives on the Torpedo called Branchellion(3) which closely resembles a Leech in its two cups, depressed body and transverse plicæ. Its anterior cup, which appears to have a very small mouth in the posterior margin, is placed on a narrowed portion resembling a neck, at the root of which is a small hole for the organs of generation; there appears to be another behind. The lateral edges of its plicæ, which are compressed and salient, have been considered as branchiæ, but I can find no vessels there; its epidermis is ample, and the envelope like a very loose sac(4). We also commonly place among the Leeches the

Clespine, Sav.—Glossopora, Johns.(5)

The Clespines have a widened body, a posterior cup only, and a prosbosciform mouth without a sucker; some of them, however, may be found to belong to the family of the Planariæ(6). I consider them more closely allied to the Phylline, Oken(7), and to the Malacobdellæ, Blainv.(8), which also have broad bodies, and are deprived of a proboscis and anterior sucker. They are parasitic animals.

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(1) The Pontobdellæ, Leach and Blainv.

(2) Add, *Pontobdella areolata;—Pont. verrucata;—Pont. spinulosa*, Leach, Zool. Miscel., lxiii, lxiv, lxv;—*Hirudo vittata*, Chamiss., and Eisenhardt, Nov. Act. Nat. Cur., t. X, pl. xxiv, f. 4.

(3) The Polydora, Oken; Branchiobdellion, Rudolphi; and the Branchiobdella, Blainv.

(4) It is the *Branchellion torpedinis*, Sav., but it must not be associated with the species found on the Tortoise (*Hir. branchiata*, Menzies, Lin. Trans., I, xviii, 3), which really appears to have branchiæ that resemble a branch of feathers, and which it is requisite again to examine.

(5) The Glossobdellæ, Blainv.

(6) *Hirudo complanata*, L., or *sexoculata*, Bergm., Stock. Mem., 1757, pl. vi, f. 12—14;—*Hir. trioculata*, Ib., f. 9—11;—*Hir. hyalina*, L., Gm., Trembley, Polyp., pl. vii, f. 7;—*Clespine paludosa*, Moq. Tand., pl. iv, f. 3, &c.

(7) Epibdellæ, Blainv.;—*Hir. hippoglossi*, Mull., Zool. Dan., liv. 1—4.

(8) *Hir. grossa*, Mull., Zool. Dan., xxi.

GORDIUS, Lin.

The body resembling a thread, the only mark of the articulations being slight, transverse plicæ; it has neither feet, branchiæ, nor tentacula. Internally, however, a nervous system is perceptible in a knotted cord. Perhaps it will be necessary in the end to place them among the cavitary Intestina, like the Nemertes.

They live in fresh water, in the mud, and in inundated grounds which they perforate in every direction.

The different species are not yet well distinguished; the most common—*Gordius aquaticus*, L., is several inches in length, almost as fine as a hair, and brown, with blackish extremities.

EXPLANATION OF THE PLATES.

Plates I, II, III represent new species of Sauria, sufficiently described in the text quoted.

Plate IV shows the osteology of certain anomalous Serpents.

Fig. 1, 2, 3. Head of a Cæcilia seen from above, beneath and in profile. It is so extremely anomalous, that it is with much hesitation that we attempt to explain it.

a.a. Intermaxillaries and Ossa Nasi united.
b.b. Maxillaries covering the orbit, and perforated by a small hole for the eye.
c. Single Os Frontis.
d.d. Anterior Ossa Frontis.
e.e. Ossa Parietalia.
f.f. Superior Os Occipitis.
g.g. Posterior Ossa Frontis?
h.h. Mastoids and Tympana united.

Fig. 4, 5, 6. Head of an Amphisbæna, seen from above, beneath and in profile.

a. Single Os Frontis proper.
b.b. Anterior Ossa Frontis.
c.c. Ossa Nasi.
d.d. Maxillaries.
e.e. Single Os Parietale.
f.f. Single Os Occipitis.
g.g. Tympana.
h. Single Intermaxillary.
i.i. Pterygoidea Interna.
k. Sphenoid.
l.l. Ossa Palati.
m.m. Petrous portions of the Temporal bone?

Fig. 7, 8, 9. Head of an Ophisaurus, viewed from above, beneath, and in profile. It is in fact the head of a Saurian.

a. Os Frontis.
b. Os Parietale.
c.c. Anterior Ossa Frontis.
d.d. Posterior Ossa Frontis.
e.e. Jugals.
f.f. Maxillaries.
g. Single Intermaxillary.
h.h. Ossa Nasi.
i.i. Ossa Temporum.
k.k. Ossa Mastoidea.
ll. Tympana.
m. Superior Os Occipitis.
n. Inferior Os Occipitis.
o. Sphenoid.
p.p. Pterygoidea interna.
q.q. Ossa Transversa.
r.r. Ossa Palati.

Plate V, fig. 1, 2, 3. Head of the Great Python of Java, showing the osteology of the head of an ordinary non-venomous serpent.

Fig. 1, as viewed from beneath; fig. 2, from above; and 3, in profile.

a.a. Ossa Frontis, properly so called.
b.b. Anterior Ossa Frontis.
c.c. Posterior Ossa Frontis.
d.d. Supra orbitals.
f. Single Os Parietale.
g.g. Ossa Mastoidea.
h. Superior Os Occipitis.
ii. Petrous portions of the Temporal bone.
k.k. Tympana.
ll. Ossa Transversa.
m.m. Pterygoidea Interna.
n.n. Ossa Palati.
o. Single Sphenoid.
p. Single Vomer.
q. Single Intermaxillary.
r. Maxillaries.
s.s. Inferior Ossa Turbinata.
t.t. Ossa Nasi.
u. Inferior Os Occipitis.
v.v. Stapes of the ear.

w.w. Os Articulare of the lower jaw.
x. Os Dentale of the lower jaw.
z. A small portion of the Supra-Angulare.

There are also two other bones on the internal face of the head, which it has been found impossible to represent in these figures.

Fig. 4, 5, 6. Head of a Rattlesnake exhibiting the osteology of the head of an ordinary venomous serpent.

The letters here designate the same bones as in the figure of the head of the Python, and the difference in their proportions, particularly those of the maxillary and pterygoid bones, are thus easily observed.

Plate VI. Head of a Codfish, showing the osteology of the head of fishes in general.

Fig. 1, the cranium seen from above; 2, from beneath; and 3, the profile of the entire head.

a.a.a. Single Os Frontis proper.
b.b. Anterior Ossa Frontis.
c.c. Posterior Ossa Frontis.
d.d. Ossa Parietalia.
e. Single Interparietal.
é. Its crest.
f.f. Superior Ossa Occipitis.
g.g. Lateral Ossa Occipitis.
h.h. Ossa Mastoidea.
i. Inferior Os Occipitis.
k. The Ethmoid.
l. Vomer.
m. Sphenoid.
n.n. Petrous portions of the Temporal bones.
o.o. Great wings of the Sphenoid.
p.p. Small wings of the same bone.
q. Intermaxillaries.
r. Maxillary.
s. Os Nasi.
t. Inferior Os Turbinatum?
u.u. Infra-orbitals.
v.v. Os Temporis.
w. Tympanum.
x. Ossa Transversa.
y. Pterygoideus Internus.
z. Jugal.
α. Preoperculum.

β. Operculum.
γ. Suboperculum.
δ. Interoperculum.
ε. Postmandibulary.
ζ. Mandibulary.
ϑ. Os Hyoides bearing the branchial rays.

Plate VII represents new species of ordinary genera.

Fig. 1. *Diodon antennatus*, Cuv., so called from the circumstance of its bearing several fleshy filaments on the fore part of the head, at *a.a.a.* as well as on other parts of its body, which are independent of its spines. Its colour is a russet grey, with dark russet spots, arranged symmetrically.

Fig. 2. *Balistes geographicus*, Péron. So named from its spots. It belongs to the first division of my Monocanthi.

Fig. 3. *Balistes penicilligerus*, Péron. So called from the ramose tentacula with which its body is bristled. It belongs to the third division of my Monocanthi.

Plate VIII. We have left here certain species of fishes, which, at the time of the publication of our first edition, formed new genera or subgenera.

Fig. 1. *Myletes macropomus*, Cuv. One of the three species of American Myletes mentioned in the note to that genus. This one is distinguished by the largeness of its opercula.

Fig. 2. *Hydrocyon brevidens*, Cuv. This species, which is from Brazil, is also mentioned in a note to the genus under which it is placed. Its specific character consists in being striped longitudinally with blackish.

Fig. 3. *Pristigaster*. A subgenus of the family of the Clupeæ This species is entirely silvery.

Fig. 4. *Sudis gigas*. An extremely large Brazilian species remarkable for its bony scales and the shortness of its tail.

Plate IX. Two species of Sternoptyx, the first of which, *Sternoptyx diaphana*, has hitherto only been known from a bad figure by Hermann. The second is new, and was discovered in the vicinity of the Azores by M. Olfers.

The *Gymnarchus senegalensis* is a new species of a genus recently discovered in the Nile by M. Rifaud.

Plate X, Fig. 1, *Notarchus*. A new genus of the *Gasteropoda Tectibranchiata*.

Fig. 2. *Pleurobranchus luniceps.* A new species of the genus Pleurobranchus. *a.* the penis; *b.b.* tentacula; *c.* the anus; *d.d.* the foot which everywhere projects beyond the body.

Fig. 3. The animal of an Anomia. *a.* part of the muscle which is connected with the third valve; *b.* the foot; *c.* a portion of the muscle which unites the two large valves; *d.d.* the mantle; *e.e,* the shell.

Fig. 4. The *Sigaretus* with its fleshy mantle enveloping and concealing its shell.

Fig. 5. The animal of a Tridacna. *a.* a fibrous bundle analogous to the threads of the Muscle, by which the Tridacna attaches itself to rocks; *b.* aperture for the entrance of water; *c.* opening corresponding to the anus; *d.* transverse muscle.

Fig. 6. A reduced sketch of the beautiful *Polyclinum diazona,* discovered by M. de La Roche, and recognized by M. Savigny as one of the compound Ascidiæ.

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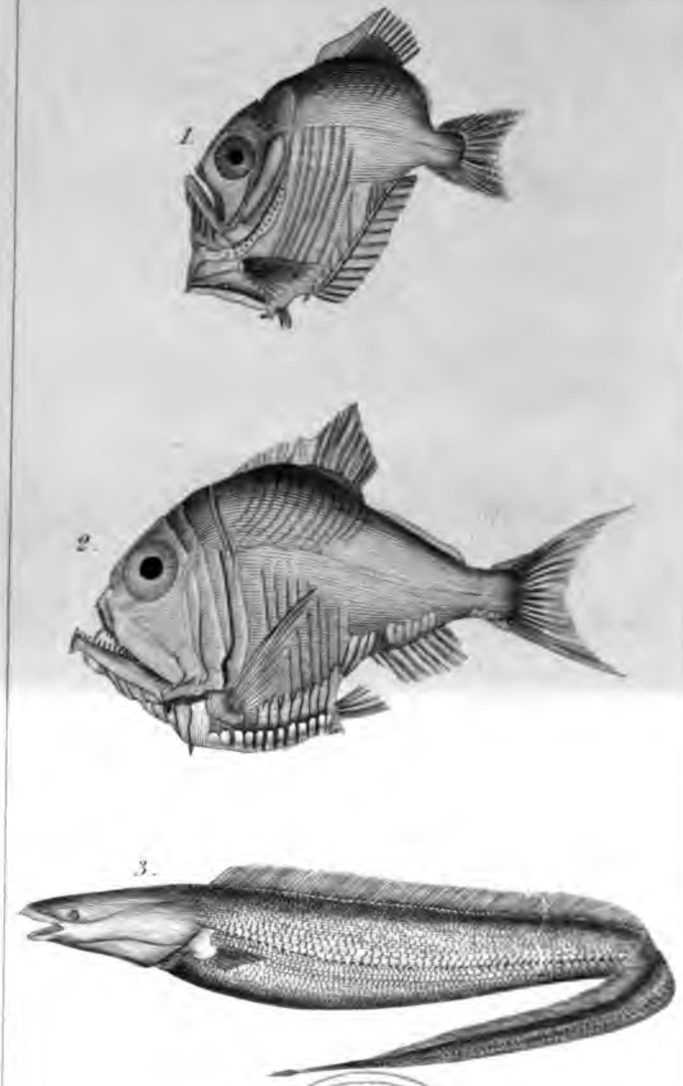

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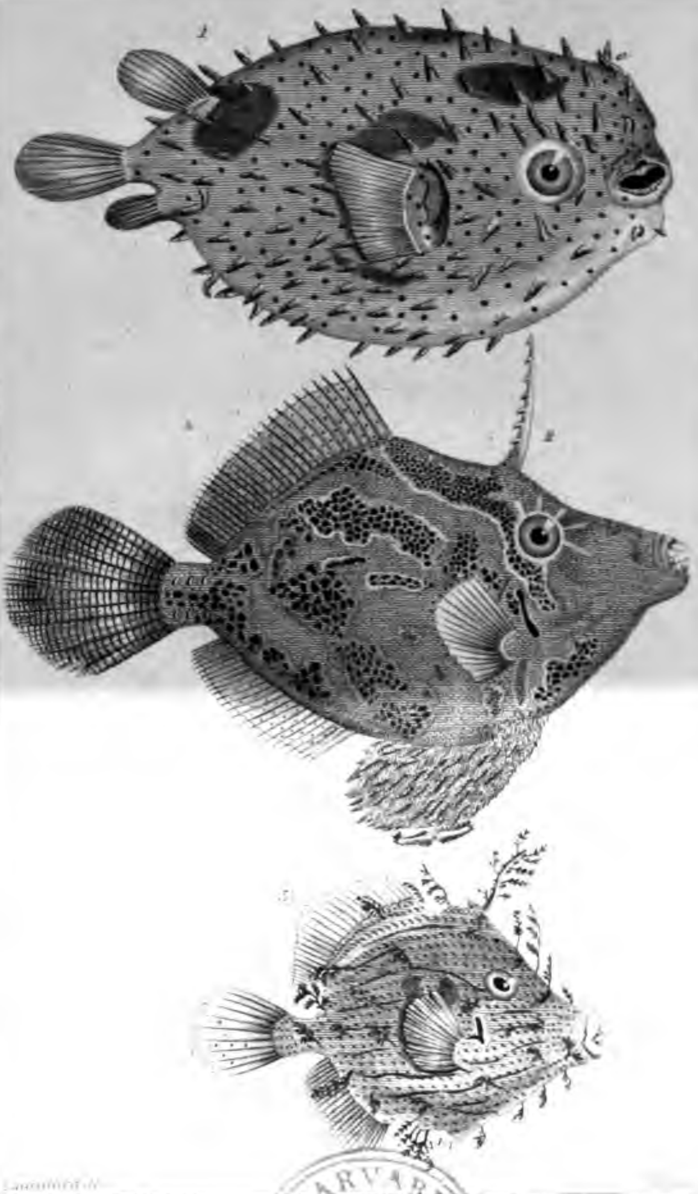

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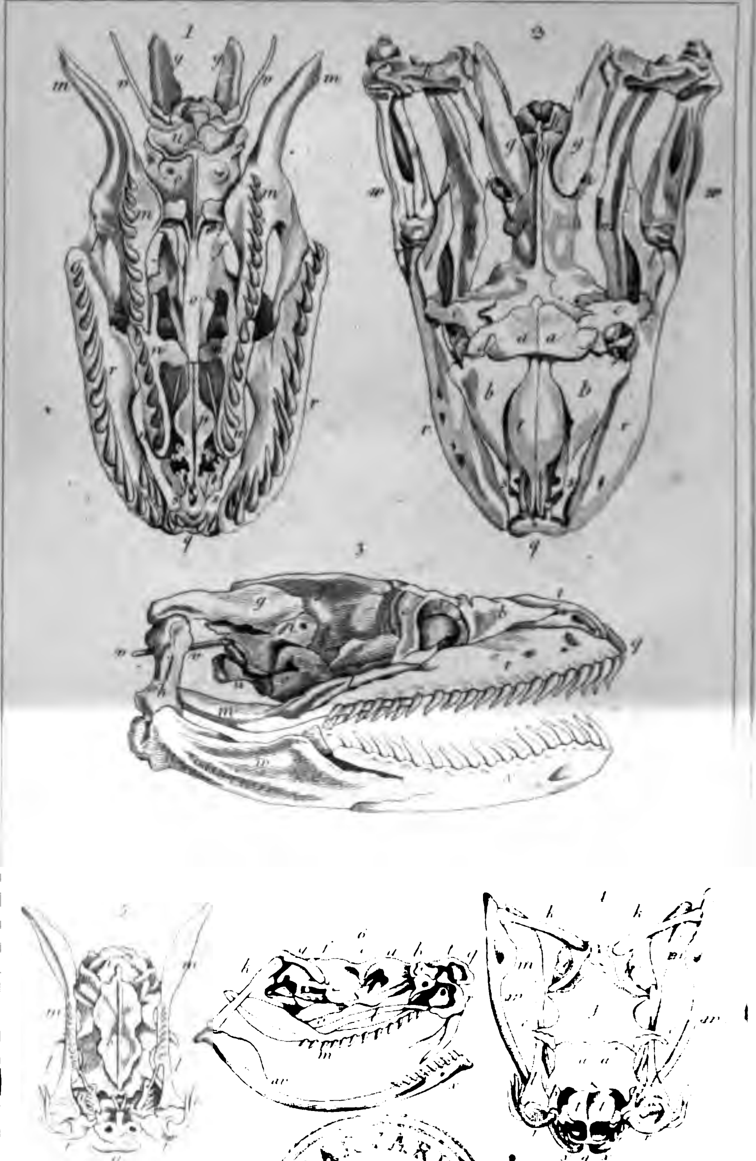

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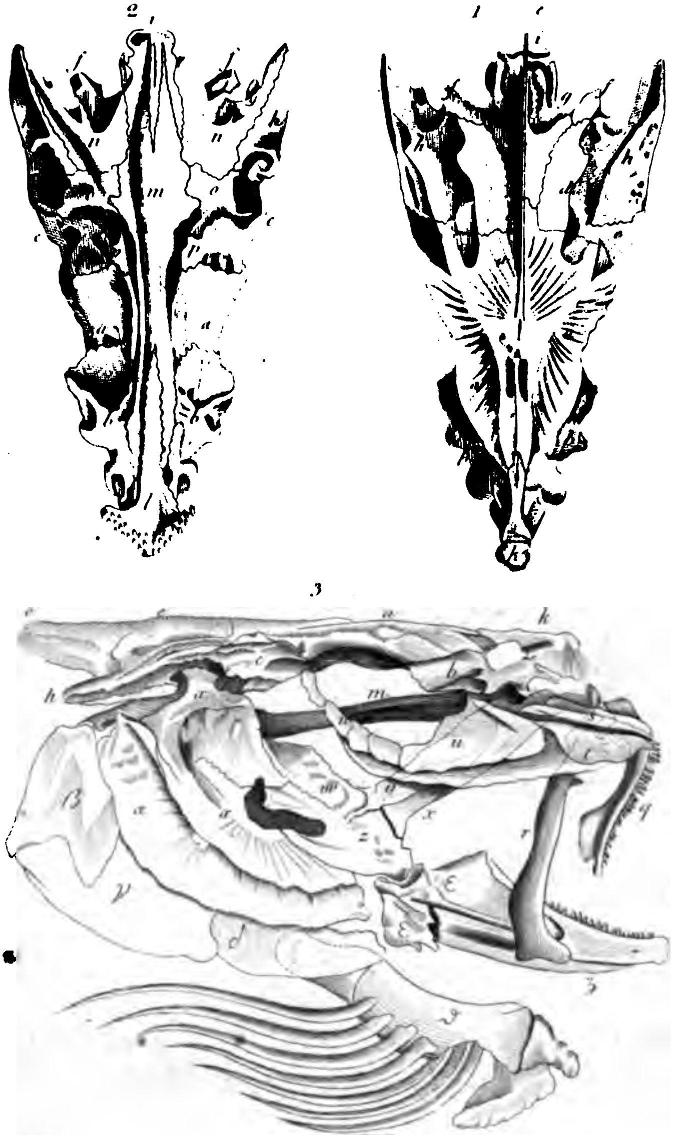
1.2.3. Head of the Great Python of Java.

4.5.6. Head of a Rattlesnake.



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Head of a Cod — Gadus morrhua L.

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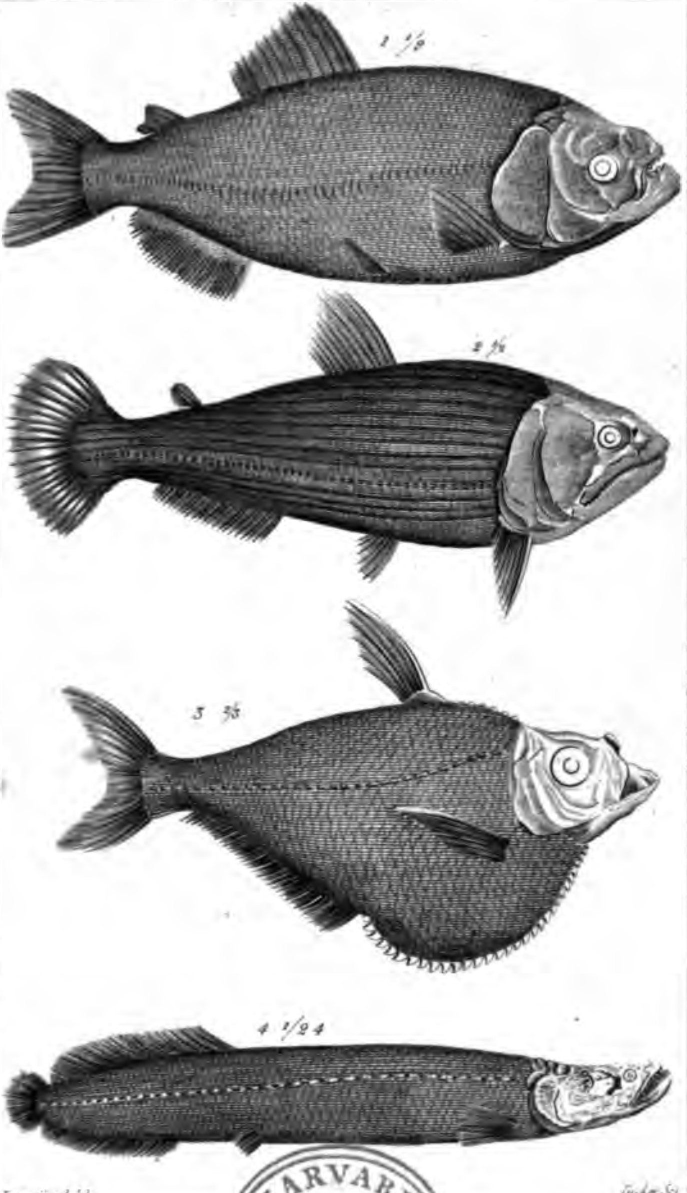

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1 *Myletes macropomus.* 2 *Hydrocyon brevidens*
3 *Pristigaster* .... 4 *Sudis gigas* ....

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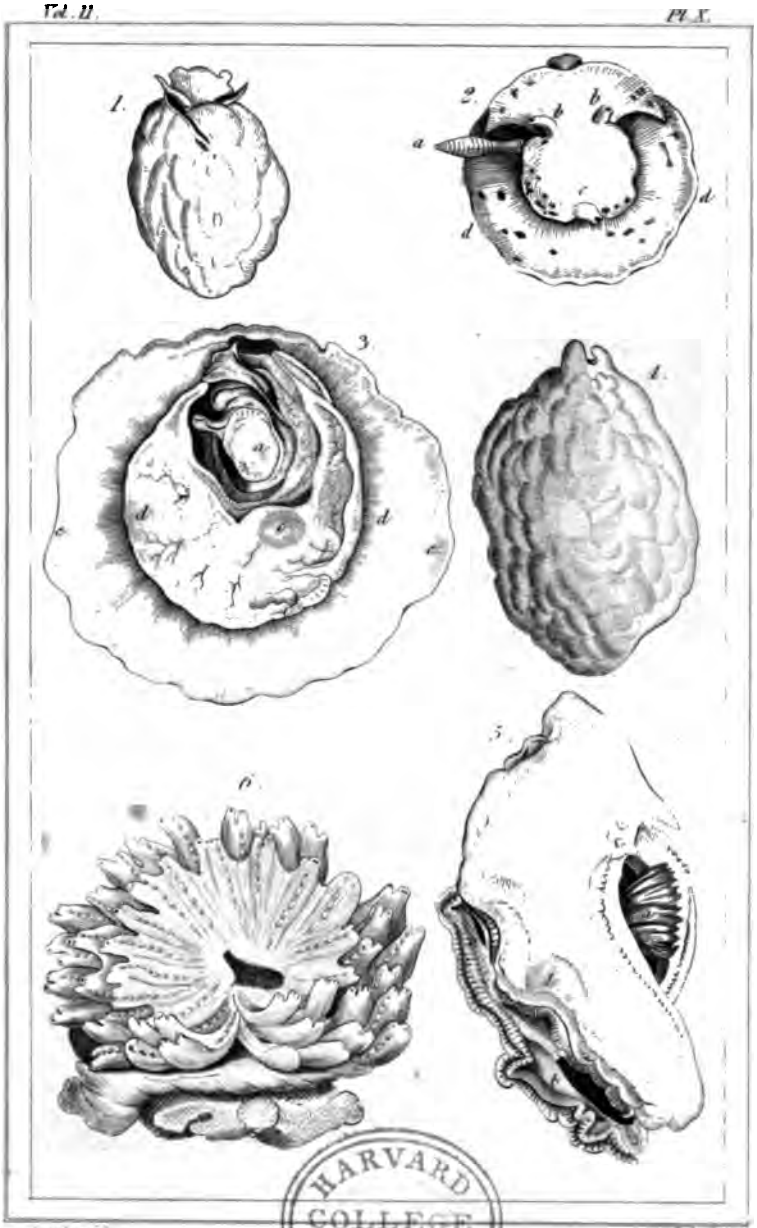

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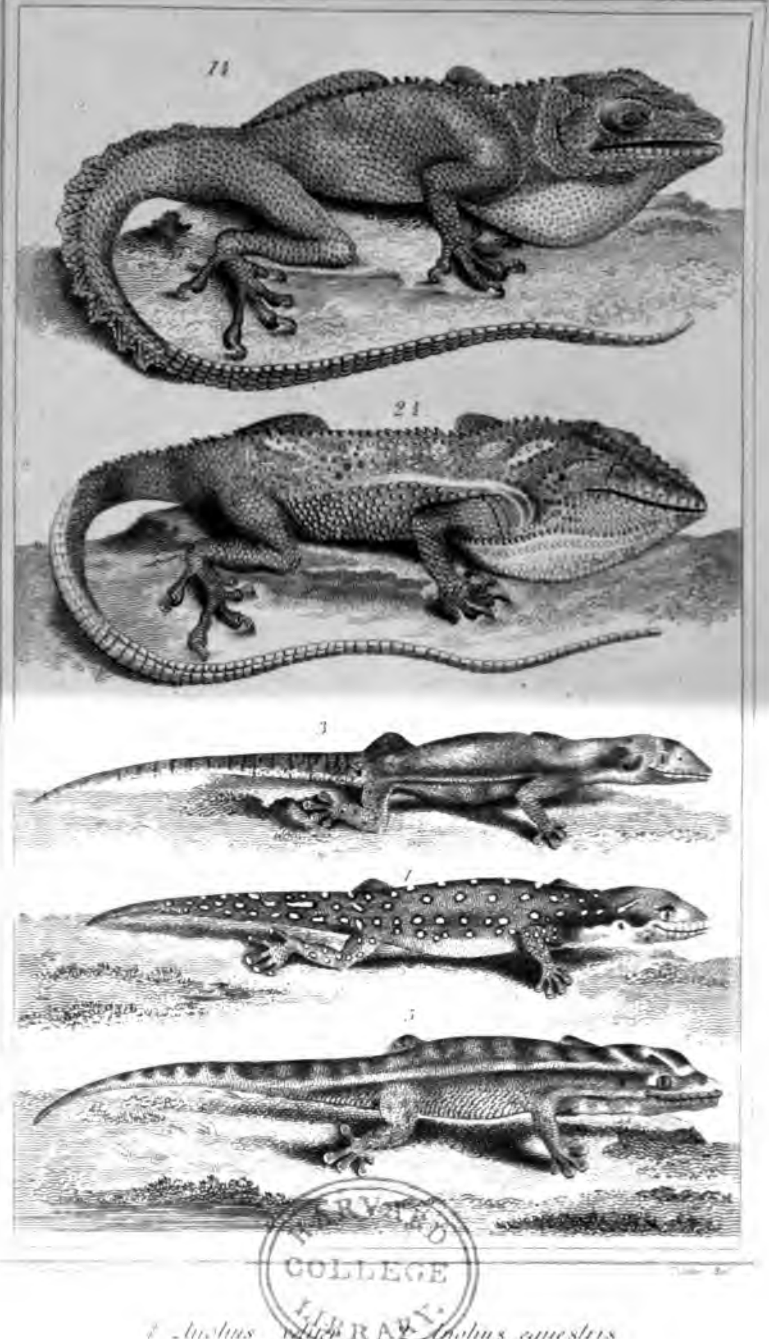
1. Notarchus. [illegible] Pleurobranchus luniceps.
3. Animal of the Anomia. 4. Animal of the Sigaretus.
5. Animal of the Tridacna. 6. Polyclinum diazona.



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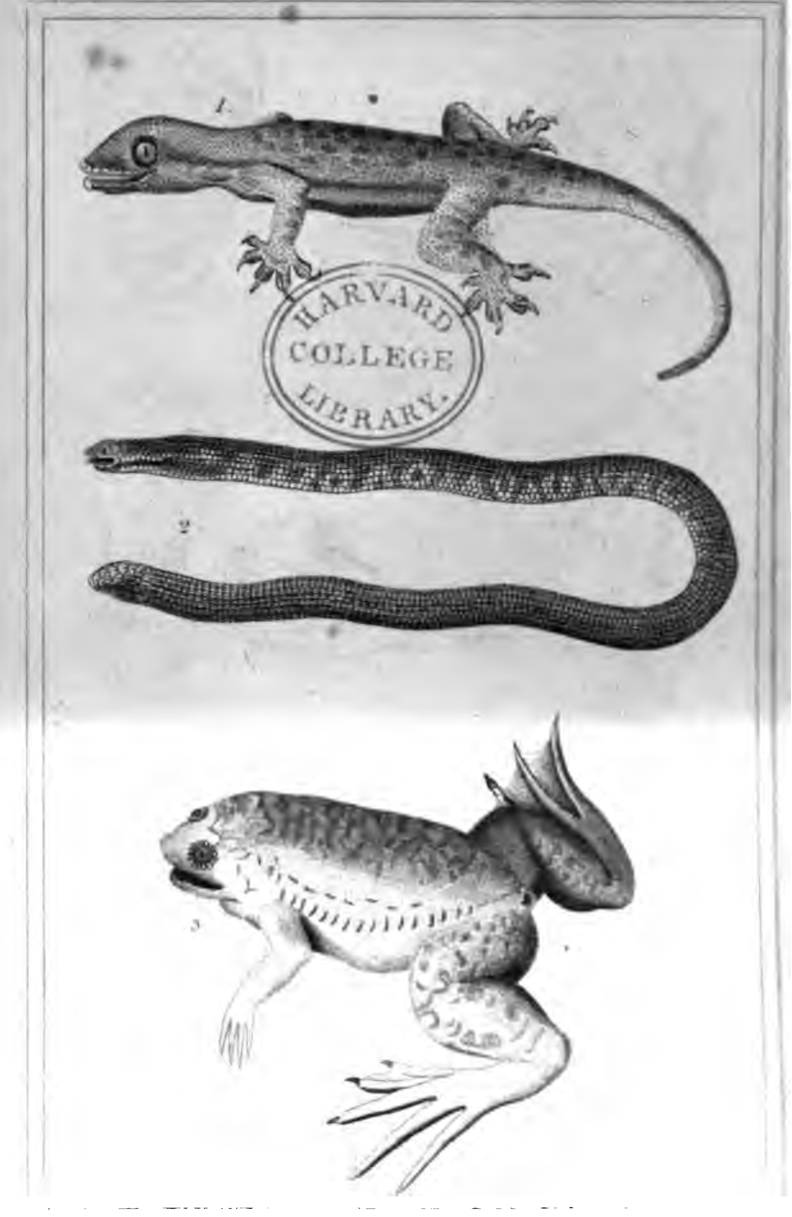
3 Gecko inunguis 4 Gecko ocellatus
5 Gecko cepedianus



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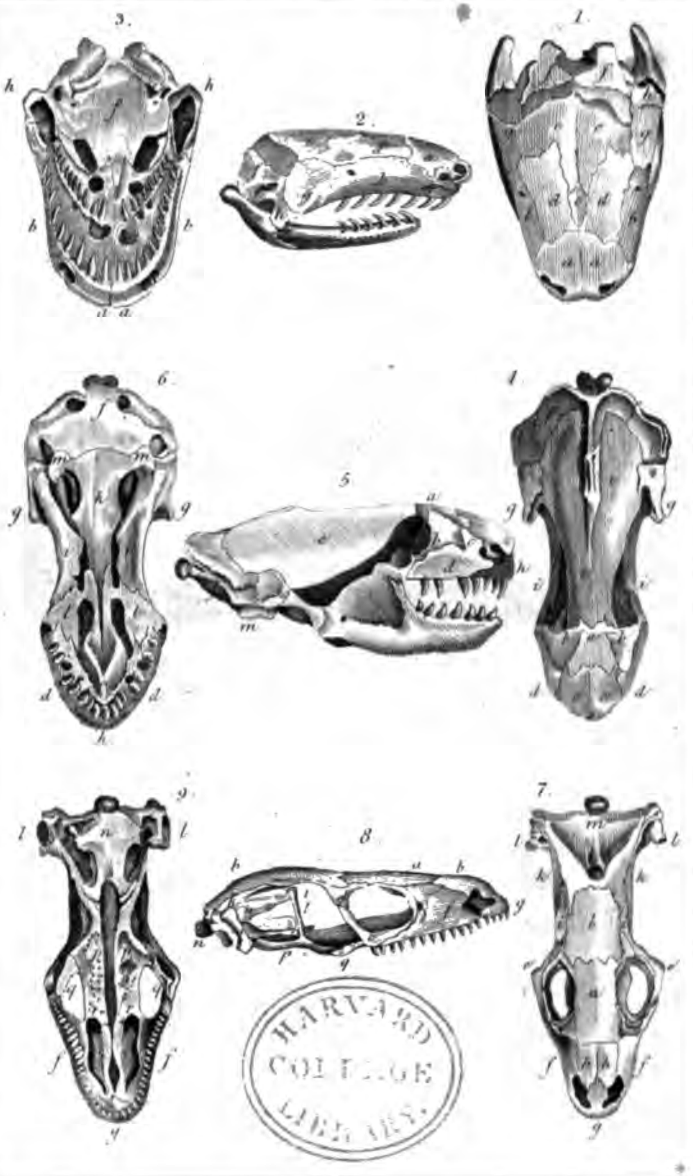
2 *Uropeltis ceylanicus*

3 *Dactylethra capensis*



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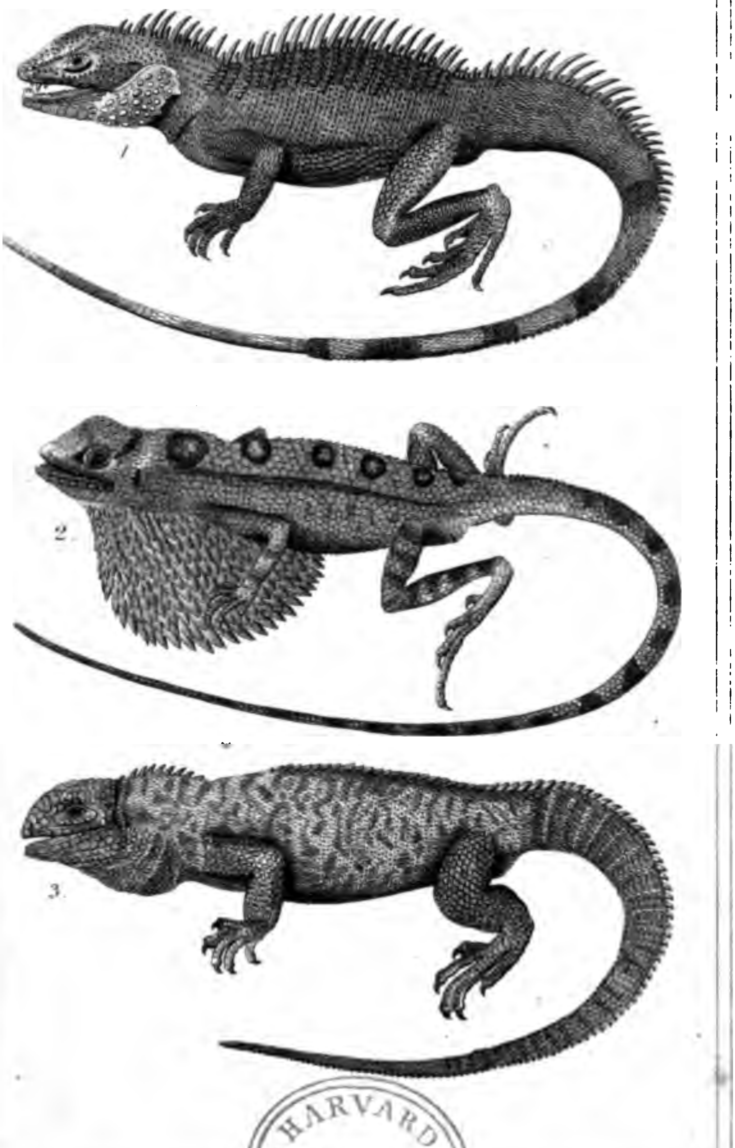
Anomalous Serpents.

1. 2. 3 Head of a Cæcilia.

4. 5. 6. Head of an Amphisbæna.

7. 8. 9. Head of an Ophisaurus.



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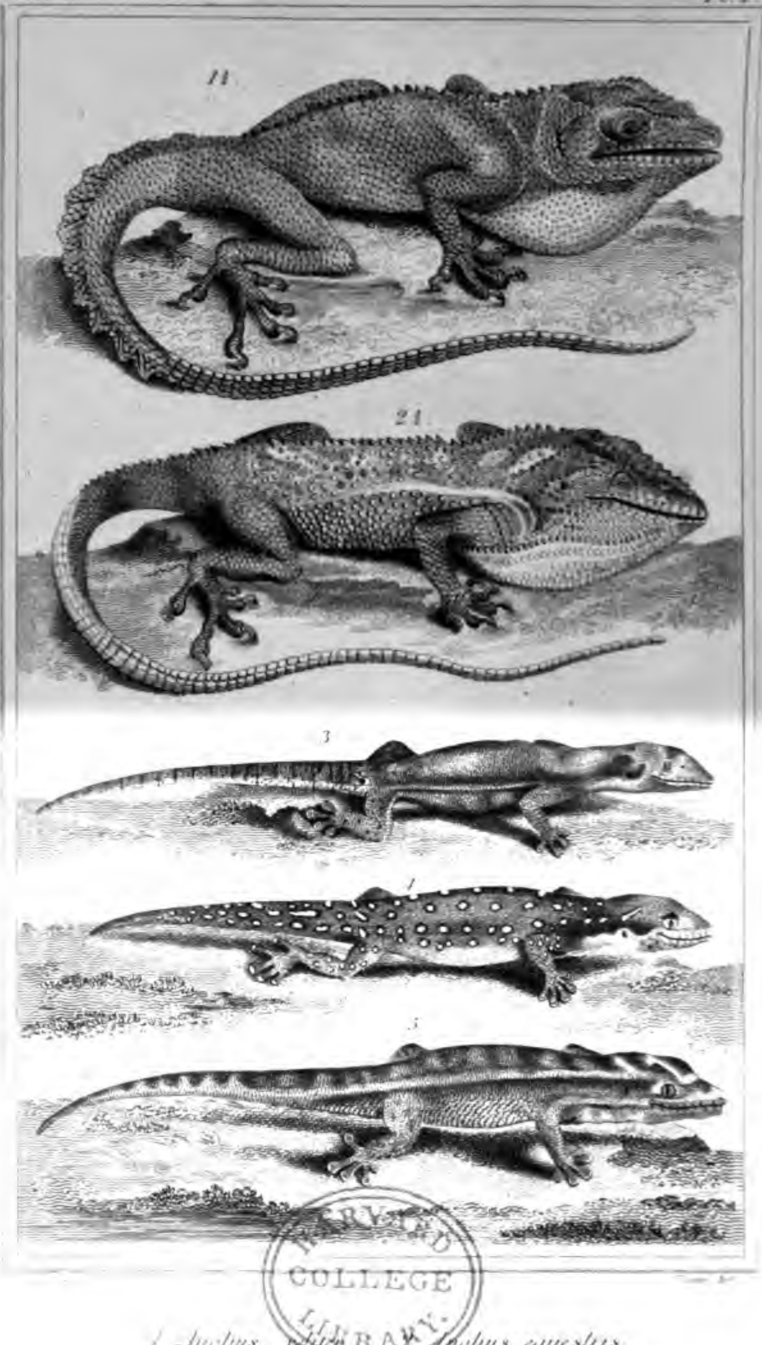
1. *Physignathus cocincinus.* 2. *Sitana ponticeriana*
3. *Iguana cychlura.*



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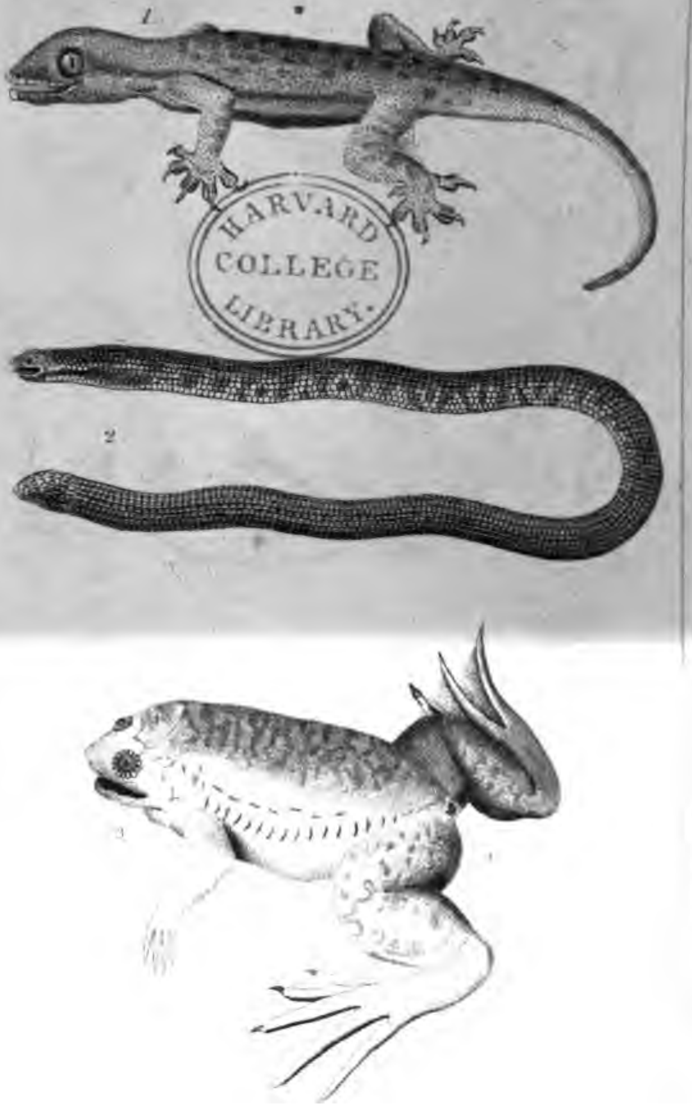
3 Gecko inunguis 4 Gecko ocellatus
5 Gecko cepedianus



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